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formerly THE BULLETIN

vol 18 no 9 SEPTEMBER 61

American Journal of Hospital Pharmacy

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American Journal of Hospital Pharmacy

American Society of Hospital Pharmacists

VOLUME 18 NUMBER 9 SEPTEMBER, 1961

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Can you afford to give away medication?

As hospital costs mount, it is becoming increasingly evident that the beneficiaries of hospital services—the patients—must assume their fair share of the costs incurred. For this to occur, the hospitals must be able to account scrupulously, either to the patients or to the various prepaid hospital plans, for all services and medication.

Old-style injections too complicated

Because accounting and billing for medication withdrawn from multidose vials has been so difficult and time consuming, many hospitals have virtually been forced to write off the cost of common injectables or, at best, to estimate them. Yet it is clear that few hospitals can afford to give away medication or to rely on estimates, which are often unacceptable by the prepaid plans.

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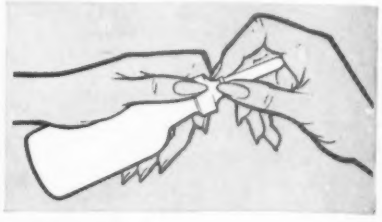

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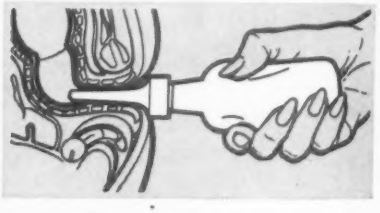

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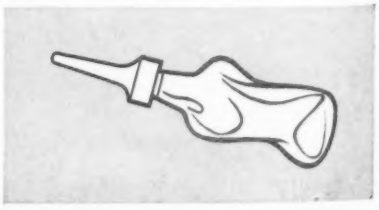

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Administration and Dosage — Capsules and Syrup: The recommended dosage in adults is 500 mg. every twelve hours or 250 mg. every six hours, continued for at least forty-eight hours after the temperature has returned to normal and all evidence of infection has disappeared. In severe or unusually resistant infections, 0.5 Gm. every six hours or 1 Gm. every twelve hours may be employed. The dose for children is 15 mg. per kilogram of body weight per day for moderately acute infections; this may be increased to 30 to 45 mg. per kilogram of body weight per day for severe infections. These doses may be administered on schedules similar to those for adults.

Parenteral: Intramuscularly — 5 cc. of Albamycin solution may be used directly by slow injection deep into the gluteal muscle.

Intravenously — it is recommended that 5 cc. of Albamycin solution be diluted further with 250 to 1000 cc. of sterile injection solution of sodium chloride, Darrow's solution, or Ringer's solution and administered by intravenous infusion, or by diluting to a suitable quantity and administered by continuous drip infusion. **Do not use with dextrose solution.** When it is necessary to use a smaller volume intravenously, 5 cc. of Albamycin solution may be diluted to a minimum of 30 cc. with one of the above diluents and administered slowly over a period of five to ten minutes to avoid irritation of the vascular endothelium. The dosage for adults is 500 mg. Albamycin administered either intramuscularly or intravenously every twelve hours. For children with moderately acute infections, the dosage is 15 mg. per kilogram of body weight per day. The daily dosage should be administered in two divided doses at intervals of twelve hours. As soon as the patient's condition permits, parenteral Albamycin should be replaced with oral Albamycin therapy.

Side Effects — Albamycin is a substance of low toxicity but is capable of inducing urticaria and maculopapular dermatitis. Leukopenia, which was rapidly reversible, has been reported in approximately 1% of cases. All of these side effects disappear rapidly upon discontinuance of the drug. In a certain few patients, a yellow pigment has been found in the plasma. This pigment is a metabolic by-product of the drug which, however, may interfere with determination of bilirubin and icteric index. Its presence is not associated with abnormal liver function tests or liver enlargement.

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*Trademark, Reg. U. S. Pat. Off. — The Upjohn brand of crystalline novobiocin sodium. †Trademark, Reg. U. S. Pat. Off.

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(1) Danowski, T. S.: Diabetes Mellitus, Baltimore, Williams & Wilkins, 1957, p. 239. (2) McCune, W. G.: M. Clin. North America 44:1479, 1960. (3) Ackerman, R. F., **et al.**: Diabetes 7:398, 1958.

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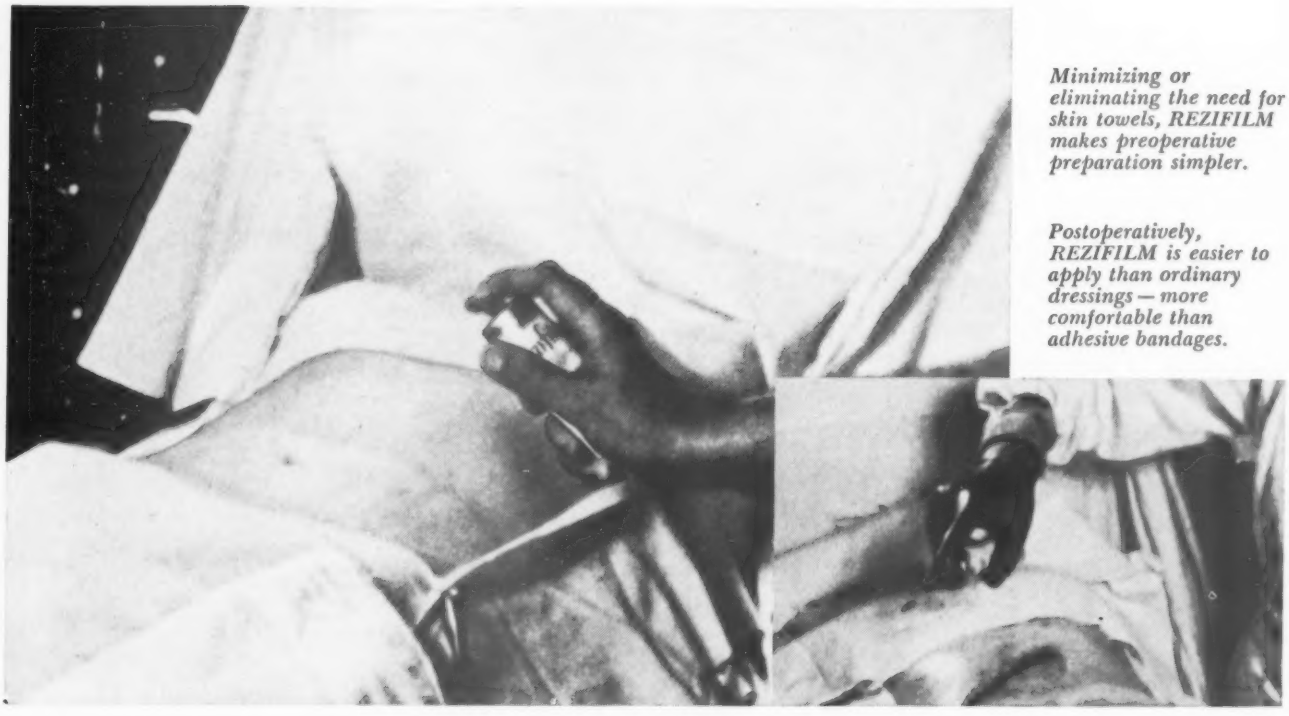

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References: 1. Eisenberg, G. M., Weiss, W., Spivack, A. P. and Flippin, H. F.: *Antibiotic Med. & Clin. Ther.*, 6:594 (1959). 2. Thomson, J. E. M.: Clinical Research Notes, Vol. 3, #3, p. 1 (1960). 3. Kanof, N. B., and Blau, S.: *Arch. Dermatol.* 83:503 (1961). 4. Bronwell, A. W.: Clinical Research Notes, Vol. 3, #3, p. 6 (1960).

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ASHP affiliates

Connecticut Society

The Connecticut Society of Hospital Pharmacists met on June 14 at the Hospital of St. Raphael in New Haven. Announcement of appointments to the Committee on Program and Public Relations was made and include the following members: David Ellis, V. A. Regional Office, Hartford, *chairman*; David Burack, Mt. Sinai Hospital, Hartford; Martin Aroian, Manchester Memorial Hospital; and Frank Ritchie, Jr., Windham Community Memorial Hospital.

The remainder of the meeting was devoted to discussion of a questionnaire regarding the licensure of hospital pharmacies in the state.

North Carolina Society

The quarterly meeting of the North Carolina Society of Hospital Pharmacists was held at the Margaret R. Pardee Memorial Hospital in Hendersonville on June 24. The meeting opened at 6:30 P.M. with a dinner at the hospital cafeteria. Among the guests present were representatives of the Geigy Pharmaceutical Company who presented President Gerald Stahl with a gift of a mortar and pestle as a token of appreciation for his outstanding service to pharmacy and the Society.

Dinner was followed by a lecture by Dr. B. J. Romeo, specialist of internal medicine in Hendersonville, and a Fellow of the Society for Nuclear Medicine. He spoke on "Radioisotopes in Medicine."

During the business session, consideration was given to the Society's contribution to the A.Ph.A.'s "Defend the Profession" campaign. Other business included discussion of the problems of drug distribution in hospitals which do not have the services of a registered pharmacist. A solution is sought through the cooperative efforts of the State Board of Pharmacy and the Liaison Committee of the North Carolina Hospital Association, along with the Committee on Minimum Standards of the North Carolina Society.

Following the business session, Mr. and Mrs. Andrew J. Darling entertained the group with a color slide review of wild flowers of Western North Carolina.

Indiana Chapter

Members of the Indiana Chapter of the American Society of Hospital Pharmacists met at 1:30 P.M. on June 20 at the Severin Hotel in Indianapolis. This quarterly meeting was held in conjunction with the Convention of the Indiana Pharmaceutical Association.

In the absence of President Donald Friedmann, Dr. Glen Sperandio presided. The program included the following presentations:

1. "Counterfeit Drugs and the Pharmacist," by Mr. George Hembrecht of the Legal Division of Smith, Kline and French Laboratories.

2. "You and Your Responsibilities," by Mr. J. E. Brackett, of Eli Lilly and Company.

3. "An Educational Program for Nurses Practicing in Smaller Community Hospitals," by Mr. Dan Hansell.

During the business meeting Vice-President Bern Grubb presided. New officers installed for the coming year include *President* Dan Hansell, Remington, Indiana; *Vice-President* Bern Grubb, Logansport; and *Secretary-Treasurer* Mildred Wiese, Indianapolis. Committees appointed for the coming year include the following: *Program and Public Relations*: Bern Grubb, *chairman,* William Stephens and Kenneth Wood. *Membership Committee*: Kenneth Gillmore, *chairman,* Eileen Foley and Dorothy Miller. *Nominating Committee*: William Wissman, *chairman,* Allen Beck and Sister Laurina Klein. *Special Committee on Pharmacy Service in Small Hospitals*: Glen Sperandio, *chairman,* Charles Schreiber and Norma Breneman.

Other business transacted included consideration of the status of the Indiana Society's membership with regard to requirements of AMERICAN SOCIETY OF HOSPITAL PHARMACISTS. The Membership Committee was asked to study this and make a report at the October meeting.

Northeastern New York Society

ASHP President Jack S. Heard met with members of the Executive Committee of the Northeastern New York Society of Hospital Pharmacists on July 11.

Plans for the new year for the Northeastern Society includes a meeting on September 27 at Leonard Hospital in Troy. Also, tentative plans are being made to visit the laboratories and research facilities of the E. R. Squibb and Company on October 12 and 13. Members of the Northeastern Society of Hospital Pharmacists will also participate in the October 14 Pharmacy Assembly of the New York State Council of Hospital Pharmacists being held at the Statler Hilton Hotel in New York City.

To: Secretaries of ASHP Affiliated Chapters

► SECRETARIES OF AFFILIATED CHAPTERS of the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS are urged to send reports of activities of meetings to Mr. Joseph A. Oddis, executive secretary, AMERICAN SOCIETY OF HOSPITAL PHARMACISTS, 2215 Constitution Avenue, N.W., Washington 7, D. C. with a duplicate to Mrs. Gloria N. Francke, associate editor, AMERICAN JOURNAL OF HOSPITAL PHARMACY, 1020 Ferdon Road, Ann Arbor, Michigan.

In submitting reports, it is essential that attention be paid to giving correct dates, complete names and titles, and as detailed information as possible. Photographs submitted for publication must be clear and suitable for reproduction.

New York State Council of Hospital Pharmacists to Hold Pharmacy Assembly

The Pharmacy Assembly of the New York State Council of Hospital Pharmacists will be held at the Statler Hilton Hotel in New York City on October 14, 1961. Plans for the program have been announced by Mr. Louis P. Jeffrey, president of the Council, along with the Program Committee headed by Sister Mary Vera of Mercy Hospital, Buffalo. Serving as Honorary Chairman of the Assembly will be Dr. August H. Groeschel of the New York Hospital, New York City. Representatives from throughout the State will participate in the following program:

Invocation by Reverend Charles Taylor, S. J., regent, College of Pharmacy, Fordham University, New York.

Greetings by Louis P. Jeffrey, president, New York State Council of Hospital Pharmacists, Albany Medical Center Hospital, Albany.

Greetings by Joseph A. Oddis, executive secretary, AMERICAN SOCIETY OF HOSPITAL PHARMACISTS and director, Division of Hospital Pharmacy, American Pharmaceutical Association, Washington 7, D.C.

Greetings by John E, McKeen, president, Chas. Pfizer and Company, Inc., New York.

"Hospital Pharmacy in Depth," by Grover C. Bowles, Jr., director, Pharmacy Service, Baptist Memorial Hospital, Memphis, Tenn.

"The Responsibility of Hospital Pharmacy," by Dr. John N. McDonnell, president, Columbia University College of Pharmacy, New York.

"Professional Prerogatives Challenged," by Dr. George F. Archambault, chief, Pharmacy Branch, Division of Hospitals, Department of Health, Education and Welfare, Washington 25, D. C.

"What to do with Literature, Brochures, etc.," by Gertrude M. Lorber, medical librarian, Pfizer Laboratories, and Harold Neham, director, Pharmacy Service, University Hospital, New York.

"Regulatory Trends in the Practice of Pharmacy in Institutions," by Kenneth S. Griswold, secretary, New York State Board of Pharmacy, Albany.

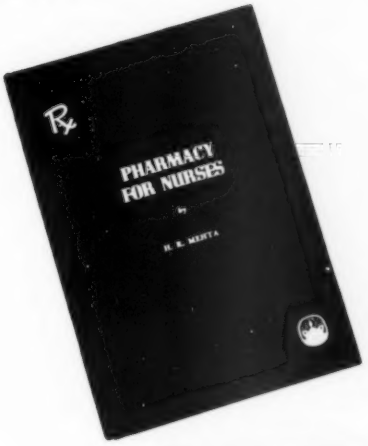
Panel Discussion

"The Right Drug in the Right Place at the Right Time," Joseph A. Oddis, presiding; Charles A. R. Connor, M. D., St. Clare's Hospital, New York; Dr. August H. Groeschel, administrator, The New York Hospital, New York; John E. McKeen, president, Chas. Pfizer and Company, Inc.; and Robert C. Bogash, pharmacist, Mount Sinai Hospital, New York.

"The Formulary System's Added Responsibility in Quality Control," by Herbert L. Flack, assistant director, Jefferson Medical College Hospital, Philadelphia, Pa.

Presiding officers during the day will include Dean Daniel H. Murray, School of Pharmacy, University of Buffalo, Buffalo; Norman Baker, vice-president, New York State Council of Hospital Pharmacists, The New York Hospital, New York; Dean Andrew J. Bartilucci, St. John's University, College of Pharmacy, Jamaica; Joseph A. Oddis; and Louis P. Jeffrey. Also serving as Honorary Chairman of the Evening Session will be Dr. John V. Connorton, executive director, Greater New York Hospital Association, New York.

A NEW



TEACHING AID

AND REFERENCE— Here's a new book— long needed and now finally available— for teaching nurses what they must know about Pharmacy and Drugs.

Entitled PHARMACY FOR NURSES, by Dr. H. R. Mehta, this book will be **an invaluable teaching asset for any Hospital Pharmacist.** Highly approved at all levels and adopted as a text by several schools, **PHARMACY FOR NURSES** is also **a valuable reference for Nursing Stations, Pharmacists and Physicians.**

Just a few of the subjects covered in this book are: Responsibility of the nurse with regard to drugs, incompatibilities of various IM injections, narcotics, investigational drugs, drug administration, poisoning due to household and drug products, medical terminology, pharmacy arithmetic, drug classification, and current drugs (with brief description, trade and generic names.)

After reviewing this book, Irvin Friesen, President of the Colorado Society of Hospital Pharmacists (C.S.H.P.) said: **"Here at last is a text many have been waiting for. In his book, Dr. Mehta demonstrates a thorough knowledge of the needs of the student and practicing nurse."**

The author, Dr. Mehta, is Educational Consultant to the C.S.H.P. and is Director of Hospital and Nursing Pharmacy programs at the University of Colorado.

—This book may be ordered directly from the publisher by using convenient order form below—

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Hospital Pharmacy Notes

No. 4 September/October/1961

by Dr. Glen J. Sperandio

Dr. Sperandio is associate professor of pharmacy at Purdue University, West Lafayette, Indiana, where he teaches dispensing and hospital pharmacy and also directs graduate research in the areas of clinical pharmacy and product formulation. He has had experience in the pharmaceutical industry and retail pharmacy as well as in hospitals, and, as editor of this series, he will discuss items of interest to the hospital pharmacist. Dr. Sperandio and Eli Lilly and Company invite your comments, suggestions, and contributions.

HOSPITAL PHARMACY RECORDS

Material which must be put into written form—requisitions, orders, inventories, purchases, and a host of other transactions—has become one of the pharmacist's chief concerns, and this "bookwork" monopolizes a large portion of time in many hospitals. Since proper records are essential to the efficient operation of any organization, the hospital pharmacist must accept the fact that, whether he likes it or not, the establishment and maintenance of such data are a part of his responsibility.

When something is inevitable, the wise man accepts it and attempts to work out the best situation possible under the circumstances. The pharmacist should assume this attitude with regard to hospital pharmacy records, and he can simplify his work if he will follow a few basic concepts about record keeping. Anything worth doing at all is worth doing well. If pharmacy records are to be used and kept efficiently, they should be designed with as much thought as are the records of the business offices—and they should be treated with as much care. All forms should be printed on a suitable grade of paper; and, once in use, they should be processed as important forms that must be filed for future reference.

When record forms are devised for the hospital pharmacy, they must be designed to fit the needs of the individual situation but should meet the criteria for good records listed in the next column.

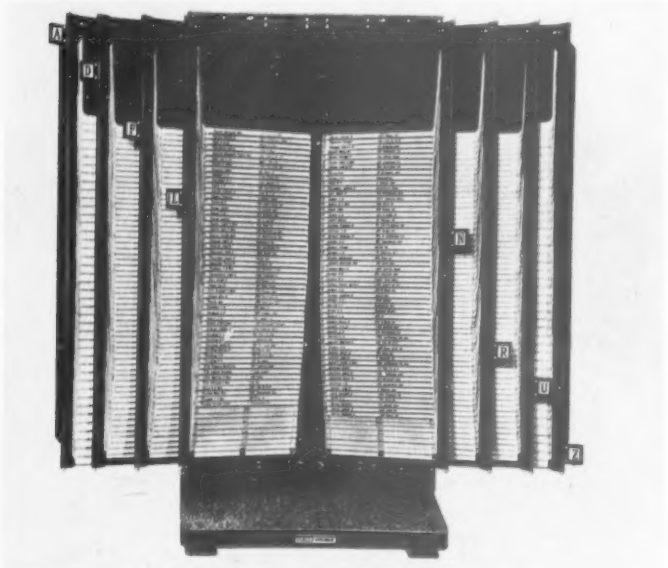
CRITERIA FOR GOOD HOSPITAL PHARMACY RECORDS

1. They must be necessary and must serve a specific purpose which cannot be achieved by other methods.
2. They must be clear, concise, easily understandable, and practical for the user.
3. They must be of a size suitable for their intended use —large enough to serve their purpose yet small enough to permit easy handling.
4. Their physical nature must be such that they can be filed, stored, or otherwise processed without difficulty.
5. They must be designed to minimize possible errors and should require a minimum amount of writing.
6. They should provide enough information to accomplish their purpose. A new employee should be able to fill them out correctly without difficulty.
7. They should be identified as pharmacy department items.
8. If intended to be used by another department in conjunction with pharmacy, they should conform to that department's style if possible.

This insert is published as a service by Eli Lilly and Company, Indianapolis 6, Indiana.

A MASTER DRUG-INFORMATION FILE FOR THE PHARMACY

The problem of establishing and maintaining a practical and easily available formulary for the hospital has been discussed by many authorities. Numerous forms have been suggested, and several excellent systems are now in use. The formulary system of the American Society of Hospital Pharmacists is widely accepted and is being adopted by more hospitals every day. To introduce still another way of cataloguing drugs might seem superfluous. However, many hospitals with no organized formulary system and others with drug information programs that need improvement might consider using a "visible" formulary. It could be kept in the pharmacy for immediate reference, and a printed edition might be compiled for the hospital staff if it seems desirable.



Oblique Stands

This master formulary could serve several purposes. First, it could act as a complete catalogue of all drugs stocked in the pharmacy and include essential information about them; second, it would permit anyone in the pharmacy to determine very quickly the information needed about a drug; third, it could be used as a perpetual inventory record; and, fourth, it can be revised and kept up to date with a minimum of effort.

The most important feature of the file is its physical arrangement, which provides easy accessibility to information. A separate card is used for each preparation, and the cards are kept in a specially designed frame which holds them so that each new card overlaps the preceding one but leaves the lower edge with key information visible. This is very similar to the index tabs of a book. The frames can be fastened to a wall bracket which permits them to be turned like the pages in a book or fitted into a base which stands upright on a desk or counter.

Equipment of this nature can be obtained from several companies, and the prices are quite reasonable. The accompanying illustrations were supplied by the Acme Visible Records Company, of Crozet, Virginia. The frames hold forty-four cards each, and the stands or brackets are supplied for four, nine, or eleven frames. The total cost for a four-frame unit is less than $75.

The cards can be designed to provide any information deemed important by the pharmacist. A sample form is shown. In addition to containing this kind of information, the cards can be used to indicate other factors, such as how the drug is administered. For example, all oral products might be listed on white cards, injectables on yellow cards, external preparations on red ones, etc. Of course, one important feature of this system is the ease with which it can be maintained. When the pharmacy adds a new product, a card for it can be prepared and put into place in a matter of minutes. Likewise, as products are deleted, the cards can be removed without having any effect on the rest of the catalogued information.

Wall Brackets

This system might also serve as a complete file on all drugs of current interest, whether they are available in the hospital pharmacy or not. Here again, the use of colored cards might be advantageous. One color could be used to indicate drugs stocked by the pharmacy; a second color could designate those not on hand.

The use of open-frame visible records in the pharmacy offers many possibilities for improved pharmaceutical service. The busy pharmacist might do well to consider this idea.

USES _____

USUAL DOSE _____ COST/DOSE _____

FORMS AVAILABLE _____

CONTRAINDICATIONS _____

LOCATION _____

PRODUCT NAME _____ MFR. _____

Eli Lilly and Company

DO YOU HAVE A. A. (ADMINISTRATIVE ABILITY)?

Heroes are made, not born; also, most department heads and executives develop through the manner in which they meet the challenges of their work. If you are a chief pharmacist or if you aspire to be one, what are your chances for success? Your answers to the following questions may indicate your suitability for an administrative position.

1. If you were called out of bed at 3:00 a.m. by the night nurse and asked to verify her calculation of a dose for a patient, what would you do?

(a) Refer her to a book in the pharmacy.
(b) Check her calculation and go back to bed.
(c) Tell her you'll do it first thing in the morning.

2. All other factors being equal, whom would you hire as a nonprofessional assistant in the pharmacy?

(a) A boy just out of high school.
(b) A local beauty-contest winner.
(c) A widow with two young children of grade-school age.

3. What would you do if you were asked to organize and prepare a formulary for the hospital?

(a) Assign this job to your best assistant and relieve him of other duties until he has completed it.
(b) Buy a copy of the A.S.H.P. formulary and make it official for your hospital.
(c) Make the job a departmental project but direct it yourself.

4. How would you handle the situation if one of the pharmacists on your staff made a foolish mistake which was obvious to others in the department?

(a) Criticize him then and there and point out the mistake.
(b) Correct the mistake yourself without making an issue of it.
(c) Talk to the pharmacist privately at your first opportunity.

5. What would you do if two ethical houses submitted identical bids on a large quantity of a pharmaceutical and you had to decide which firm was to get the order?

(a) Tell each firm of the situation and ask for a second bid.
(b) Buy from a third firm because the first two are obviously in collusion.
(c) Order from the firm which placed its bid first.

6. What would your reaction be if your administrator told you that he had been invited to talk to a service club about new developments in cancer research and asked your help in writing his speech?

(a) Volunteer to give the speech in his place.
(b) Prepare an outline for his talk, supported by abstracts of recent articles on the subject.
(c) Write the talk for him because you know this is what he really wants.

7. You have been promoted over another man to the position of chief pharmacist. He does his job well but is continually antagonistic in his attitude toward you. How would you handle him?

(a) Tell him to get the chip off his shoulder or you'll fire him.
(b) Ignore his unpleasantness, treat him courteously, and give him credit for work well done.
(c) Find a job for him in another hospital and suggest that he take it.

8. A nurse brings you an empty container for a floor-stock item and says that it was sent to her that way from the pharmacy. Your assistant insists that it was filled when it left the pharmacy. What would you do?

(a) Refill the container and give it to the nurse.
(b) Tell her you believe your own staff and refuse to give her more.
(c) Ask her to accompany you to the administrator and ask his advice.

9. Your hospital is establishing an isotope laboratory, and the administrator is undecided whether to place it under the direction of the roentgenologist or the chief pharmacist. What would you suggest?

(a) That it be placed under the supervision of the pharmacy.
(b) That it more properly belongs in the area of the roentgenologist.
(c) That it be given to the department that wants it the most.

10. A member of the hospital's board of directors comes in the pharmacy and asks for a legend drug for his personal use. How would you take care of this problem?

(a) Give him the medication along with proper dosage information.
(b) Call the resident physician and ask him to O. K. your writing a prescription for the drug.
(c) Tell the man that pharmacy policy does not permit you to let him have the drug.

ANSWERS—Check your answers with the correct ones listed below. Allow yourself ten points for each answer you have correctly marked. A score of 80 or more establishes you as a candidate for a chief's position now; one of 70 indicates that you have potential but need a little more experience. If your score is 60 or less, your case is not hopeless, but you have work to do before you take on added responsibilities.

1. (b)	5. (c)	8. (a)
2. (a)	6. (b)	9. (a)
3. (c)	7. (b)	10. (c)
4. (c)		

HALDRONE™

(paramethasone acetate, Lilly)

For Predictable Anti-Inflammatory Effect

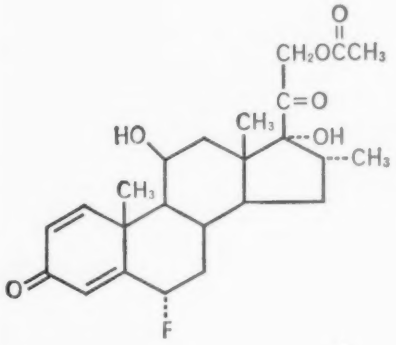
Description

Haldrone provides a predictable anti-inflammatory effect with a low incidence of untoward reactions. In ACTH suppression tests, it appears to be approximately nine times as potent as hydrocortisone. Extensive long-term clinical metabolic studies with Haldrone revealed that sodium retention is unlikely; and, with average dosage, little change occurs in either sodium or potassium excretion.

Psychic effects are minimal; C.N.S. side reactions, such as euphoria and restlessness, are not usually encountered. Muscle weakness and cramping do not appear to accompany therapy with Haldrone, and only occasionally is there a significant appetite-stimulating effect. Anorexia is almost never seen.

Chemistry

Haldrone is 6α-fluoro-16α-methylprednisolone 21-acetate. Its structural formula is as follows:



Indications

Collagen diseases—rheumatoid arthritis, systemic lupus erythematosus, polyarteritis

Allergic diseases—asthma, hay fever, drug sensitivity

Dermatological disorders—atopic dermatitis, contact dermatitis, poison ivy, neurodermatitis, urticaria, exfoliative dermatitis

Hematological diseases—acquired hemolytic anemia, idiopathic thrombocytopenic purpura, leukemia (palliative)

Miscellaneous disorders—nephrotic syndrome, gout (initial therapy), ulcerative colitis, adrenogenital syndrome, sarcoidosis, bursitis, pulmonary emphysema, regional ileitis

Dosage

To initiate therapy in patients not previously treated with steroids

In chronic conditions—In rheumatoid arthritis (or chronic conditions that are not life-threatening), initial dosage should ordinarily be 6 to 8 mg. daily, given in three or four divided doses. When the desired response is obtained, dosage should be decreased by 0.5 to 1 mg. every three to five days until a satisfactory maintenance level is reached. Minimum dosage levels should be used in all cases of prolonged therapy.

In severe conditions—The initial dosage requirements will range from 6 to 12 mg. of Haldrone daily, administered in three or four divided doses. When the desired initial response is obtained, dosage should be decreased by 0.5 to 1 mg. every three to five days to a maintenance level.

The average suppressive and maintenance dosage schedule in the treatment of several common diseases is as follows:

Disease	*Initial suppressive daily dose (mg.)*	*Maintenance daily dose (mg.)*
Rheumatoid arthritis	6-8	1.5-4
Systemic lupus erythematosus	6-12	4-8
Asthma	6-12	2-6
Hay fever	4-8	2-4
Pulmonary emphysema	6-12	2-6
Skin diseases	6-12	2-4
Ulcerative colitis	6-12	3-6
Adrenogenital syndrome	1-4	1-4
Nephrotic syndrome	6-12	4-8 (3 days/week)

Some patients with chronic conditions may be maintained on a b.i.d. dosage, especially if the severity of the condition is mild to moderate.

To transfer patients from other corticosteroids to Haldrone

Haldrone may be administered to replace other corticosteroids on a tablet-for-tablet basis as follows:

Haldrone, 2 mg., is approximately equivalent to—

Cortisone	25 mg.
Hydrocortisone	20 mg.
Prednisone or prednisolone	5 mg.
Triamcinolone or methylprednisolone	4 mg.
Dexamethasone	0.75 mg.

Contraindications

The usual contraindications to corticosteroid therapy apply to Haldrone. Except in selected acute life-threatening disorders, it should not be used in patients with active or suspected tuberculosis, active peptic ulcer, psychoses, or herpes simplex of the eye.

Precautions

Haldrone should be used with caution in patients with diabetes mellitus, infectious diseases, congestive heart failure, osteoporosis, emotional lability, diverticulitis, or thrombophlebitis. Great care should be taken when steroids are used in the presence of overwhelming infections, even though appropriate antibiotic therapy is used concomitantly.

If Haldrone is used during pregnancy, the possibility of adrenal insufficiency in the newborn or in the mother at the time of delivery should be considered. Prolonged corticosteroid therapy in children is hazardous because of growth suppression or the risk of serious bacterial or viral infections, which are often masked and refractory to treatment.

If therapy is discontinued, especially after prolonged treatment, a gradual reduction in dosage of 0.5 to 1 mg. every three to five days is indicated. Subsequently, if stress should cause adrenal cortical insufficiency, it may be necessary to administer Haldrone again for a given period of time (or, in severe cases and when sodium retention is desired, parenteral hydrocortisone may be indicated).

Side-Effects

Therapy with Haldrone is seldom accompanied by edema. Electrolyte abnormalities are unlikely. As in the case of other corticosteroids, side-effects reported include rounding of the face, ecchymosis, insomnia, weight gain, hypertrichosis, thinning of the skin, peptic ulcer, occurrence of infections, and increased appetite. In prolonged therapy at suppressive dosage, the features of Cushing's syndrome may occur.

Supplied

Tablets: 1 mg. (Yellow, scored) and 2 mg. (Orange, scored), in bottles of 30, 100, and 500.

NOTE: References and a more detailed discussion of Haldrone are available from the Medical Services Department, Eli Lilly and Company, Indianapolis 6, Indiana.

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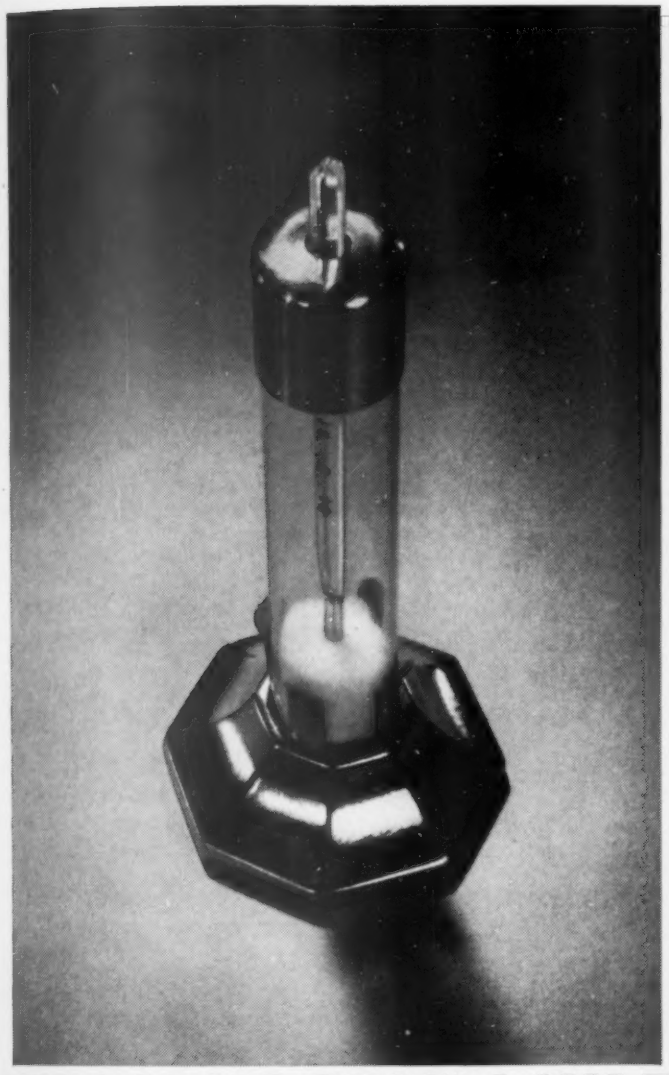

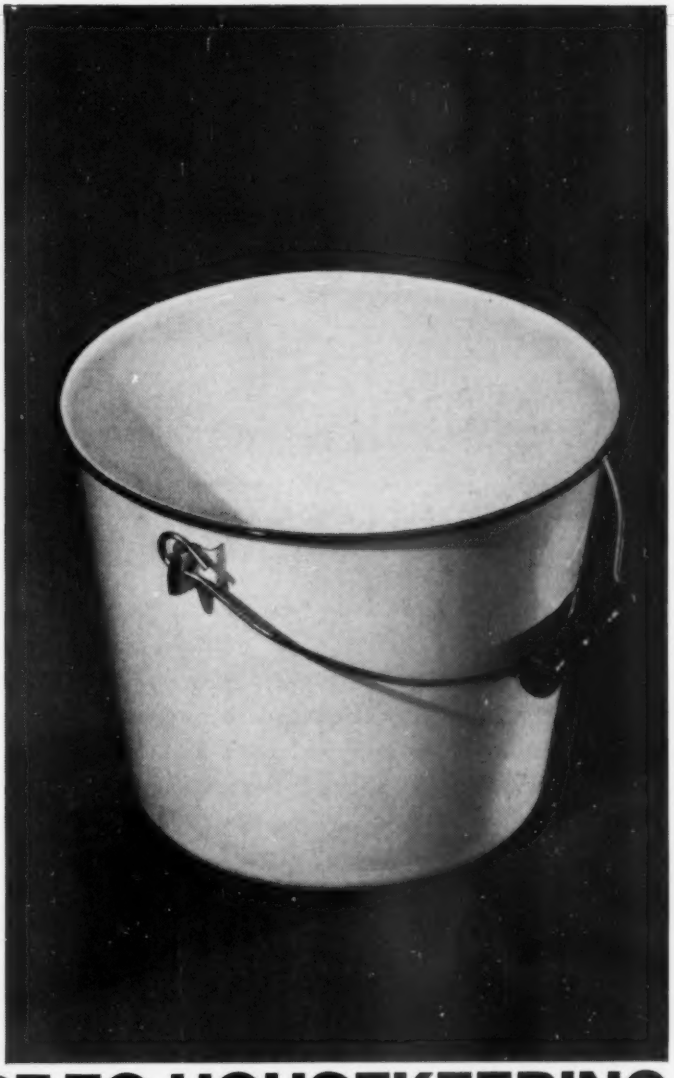

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No. 1 **of a series reporting on Endo Laboratories' Anticoagulant Survey**

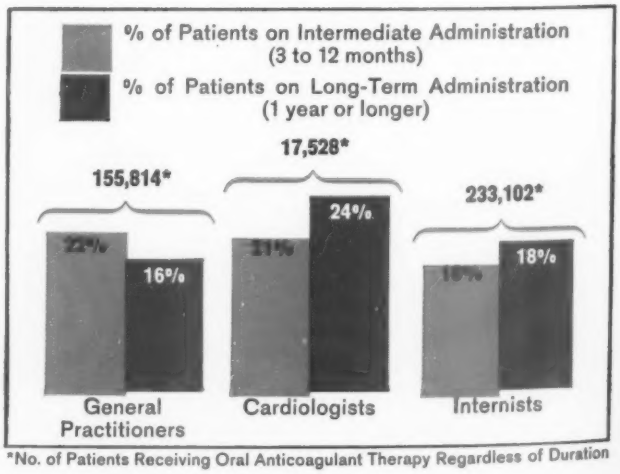
Nationwide Survey Explores Current Practices in Anticoagulant Therapy

Early in 1961 Endo Laboratories undertook a comprehensive survey of physicians' attitudes toward oral anticoagulants and their application in daily practice. Approximately 90,000 physicians received a questionnaire which covered such basic matters as *when, how,* and *for what periods* anticoagulants were used, the *specific advantages* of the agent most often selected by general practitioners, internists, and cardiologists, *factors* relating to the effective, safe administration of anticoagulants, and other pertinent areas of clinical interest. A total of 10,016 physicians completed and returned the *Anticoagulant Survey.*

The vast accumulation of data has now been analyzed and tabulated so that one can draw conclusions regarding the actual practice of thousands of physicians. Endo is happy to present the findings of *Anticoagulant Survey* in the first of a series of brief reports. It is our purpose thereby to contribute to a better understanding of the use of anticoagulants, therapeutically and prophylactically. We would greatly appreciate your comments and observations on this series. For more detailed information on *Anticoagulant Survey,* write to the Professional Service Dept., Endo Laboratories, Richmond Hill 18, New York.

Long-Term Anticoagulant Therapy of Myocardial Infarction More Widely Accepted

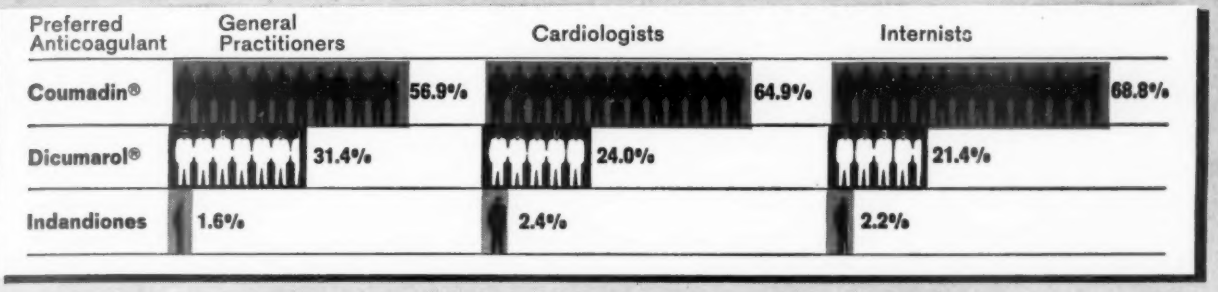
Broad clinical experience[1-12] has indicated the value of oral anticoagulants in preventing or minimizing the occurrence of myocardial infarctions and extending life expectancy, particularly on long-term use. Reports from general practitioners and specialists reveal that these life-saving agents are being used *prophylactically* not only after frank myocardial infarction but also in *impending* infarction associated with angina pectoris. The following table shows the percentage of patients who have been maintained on oral anticoagulant therapy for extended periods of time, according to replies of physicians who answered the Endo anticoagulant questionnaire.



*No. of Patients Receiving Oral Anticoagulant Therapy Regardless of Duration

Specialists and General Practitioners Using Coumadin Increasingly

A comparison of Coumadin (warfarin sodium), Dicumarol (bishydroxycoumarin), and Indandiones showed that coumarin derivatives were prescribed most often and that Coumadin was the drug of choice by a wide margin.



It is noteworthy that 80% of the general practitioners, 80% of the internists, and 86% of the cardiologists favoring Coumadin reported their use of oral anticoagulants to be **increasing.** Of 3,092 responding physicians in general practice, 564 had had patients on Coumadin for one year, 628 for two years, 479 for three years, 215 for four years, 181 for five years, and 149 for **more than five years.**

Specialists Favor Tapering Anticoagulant Dosage Before Discontinuance

Abrupt cessation of anticoagulant therapy, especially after long-term administration, has been cautioned against by some clinicians[5,12] because of the possibility of a consequent state of *hypercoagulability* with increased risk of thromboembolism. *Anticoagulant Survey* showed that of the general practitioners who stated their procedure more than half did *not* taper the dose before discontinuance; on the other hand, a majority of internists and cardiologists did taper the dose over several weeks.

Periodic Prothrombin Time Tests Essential to Effectiveness and Safety

Especially in long-term therapy, *periodic prothrombin time determinations* are recognized as vital to effectiveness and safety. Most of the reporting physicians are having these tests performed at one-week, two-week, or four-week intervals. The following data from *Anticoagulant Survey* indicate that the predominant trend is toward testing at intervals of two weeks or longer, and that this procedure is observed by a significantly higher percentage of reporting physicians who prefer Coumadin than by those who favor Dicumarol.

Preferred Anticoagulant	PT Tests Every Week		PT Tests Every 2 to 4 Weeks or Longer	
	GP's	Specialists	GP's	Specialists
Coumadin	17%	16%	63%	67%
Dicumarol	27%	23%	55%	60%

The preferred prothrombin time range was between 1½ to 2½ times normal control; the most favored prothrombin time was twice normal, or 26 seconds. (Complications of anticoagulant therapy will be discussed in a subsequent report.)

Physicians Stress Predictability and Ease of Maintenance in Selecting Anticoagulant

In characterizing the *advantages* of the oral anticoagulant most often prescribed (Coumadin), general practitioners, cardiologists, and internists were unanimous in listing, in order of importance: (1) *more predictable effect,* (2) *easier maintenance,* and (3) *single daily dose.* Among Dicumarol prescribers, on the other hand, "single daily dose" was first in importance, "more predictable effect" second, and "easier maintenance" third.

These data confirm the unusually consistent recognition of Coumadin advantages which have made possible a smoother, more easily managed long-term anticoagulant regimen. Since Coumadin may be given I.M. and I.V. as well as orally, it is also the most versatile of anticoagulants in hospital or office practice.

References: 1. Thomes, A. B., et al.: J.A.M.A. 176:181, 1961. 2. Nora, J. J.: **Ibid.** 174:118, 1960. 3. **Idem:** M. Times 89:502, 1961. 4. Beamish, R. E., and Storrie, V. M.: Heart Bull. 10:41, 1961. 5. Nichol, E. S., et al.: Am. Heart J. 55:142, 1958. 6. Manchester, B.: Ann. Int. Med. 47:1202, 1957. 7. Report of Working Party on Anticoagulant Therapy in Coronary Thrombosis to M. Res. Council: Brit. M. J. 1:803, 1959. 8. Friedberg, C. K.: New York J. Med. 58:877, 1958. 9. Seaman, A. J.: GP 22:135, No. 4, 1960. 10. Stephens, C. A. L., Jr.: Arizona Med. 17:499, 1960. 11. Canady, E. W., et al.: Illinois M. J. 113:50, 1958. 12. Littman, M. L.; Barrett, E. A., and Shapiro, S.: Scientific Exhibit, 110th Annual Meet., A.M.A., New York, N. Y., June 25-30, 1961.

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Dear Doctor:

Reports from our representatives indicate that many physicians would appreciate simplification for prescription-writing purposes of the names of our oral broad-spectrum antibiotics, which include Terramycin, Signemycin and Tetracyn in both the "plain" and the "COSA" dosage forms.

The "COSA" forms originated, you may recall, on the basis of clinical evidence of enhanced antibiotic absorption when glucosamine is employed in oral administration. To permit each physician individually to study this evidence and choose which form he would prefer to prescribe, we offered our oral broad-spectrum antibiotics in both forms -- that is, in the regular Terramycin, Signemycin and Tetracyn forms without glucosamine, and in the "COSA" forms with glucosamine.

This distinction appears to be no longer necessary, however, since glucosamine, a highly acceptable excipient for oral antibiotics, now is being incorporated uniformly in all such forms, thereby simplifying nomenclature and your prescription writing.

Accordingly, and effective immediately, our oral broad-spectrum drug forms, incorporating glucosamine, will be offered simply as Terramycin, Signemycin and Tetracyn, without the "COSA" prefix. To make clear just which forms are affected, please refer to the brief tabulation on the opposite page of our oral broad-spectrum dosage forms both before and after this change. We are also requesting our representative to call on you at an early date to answer any questions that may arise.

We feel certain that this action, prompted by comments of many physicians, will simplify your writing of prescriptions for these Pfizer Laboratories oral broad-spectrum antibiotics.

We welcome your comments on this action, and on any other phase of our operations, since it is our objective to render every service as efficiently as possible to our friends in the medical profession.

Sincerely,

PFIZER LABORATORIES

NOTE: This message is currently appearing in leading medical and dental journals.

IMPORTANT ANNOUNCEMENT:

Product names
for Pfizer broad-spectrum antibiotics
have been **simplified**

the name now is simply... **Terramycin®**
OXYTETRACYCLINE WITH GLUCOSAMINE

formerly named	*now named*
Cosa-Terramycin® Capsules	**Terramycin® Capsules***
Cosa-Terrabon® Oral Suspension	**Terramycin Syrup**
Cosa-Terrabon Pediatric Drops	**Terramycin Pediatric Drops**

and simpler names for these Terramycin-containing formulations:

Cosa-Terrastatin® Capsules	**Terrastatin® Capsules**
Cosa-Terrastatin for Oral Suspension	**Terrastatin for Oral Suspension**
Cosa-Terracydin® Capsules	**Terracydin® Capsules**

the name now is simply... **Tetracyn®**
TETRACYCLINE WITH GLUCOSAMINE

formerly named	*now named*
Cosa-Tetracyn® Capsules	**Tetracyn® Capsules***
Cosa-Tetrabon® Oral Suspension	**Tetracyn Syrup**
Cosa-Tetrabon Pediatric Drops	**Tetracyn Pediatric Drops**

and simpler names for these Tetracyn-containing formulations:

Cosa-Tetrastatin® Capsules	**Tetrastatin® Capsules**
Cosa-Tetrastatin for Oral Suspension	**Tetrastatin for Oral Suspension**
Cosa-Tetracydin® Capsules	**Tetracydin® Capsules**

the name now is simply... **Signemycin®**
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formerly named	*now named*
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Cosa-Signebon® Oral Suspension	**Signemycin Syrup**
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*Terramycin and Tetracyn Capsules without glucosamine are no longer available.

Science for the world's well-being® Pfizer **PFIZER LABORATORIES Division, Chas. Pfizer & Co., Inc. New York 17, N. Y.**

Sometime this month the 100,000,000th injection of Mercuhydrin will be given.

We can interpret this figure in many ways . . . First of all, in terms of lives prolonged or saved . . . in terms of therapeutic advances, for the modern approach to therapy of congestive heart failure owes much to the long-established efficacy and safety of this drug. The published literature, clinical and experimental, is enormous and continuous. After more than 15 years Mercuhydrin remains the pharmacologic standard for the clinical comparison of diuretics. And as a pharmaceutical preparation, Mercuhydrin has not been surpassed in its stability and reliability. Lakeside is indeed proud of Mercuhydrin.

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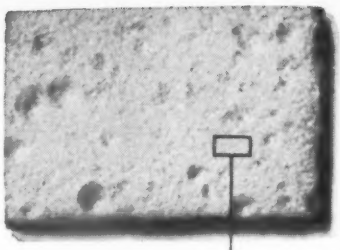
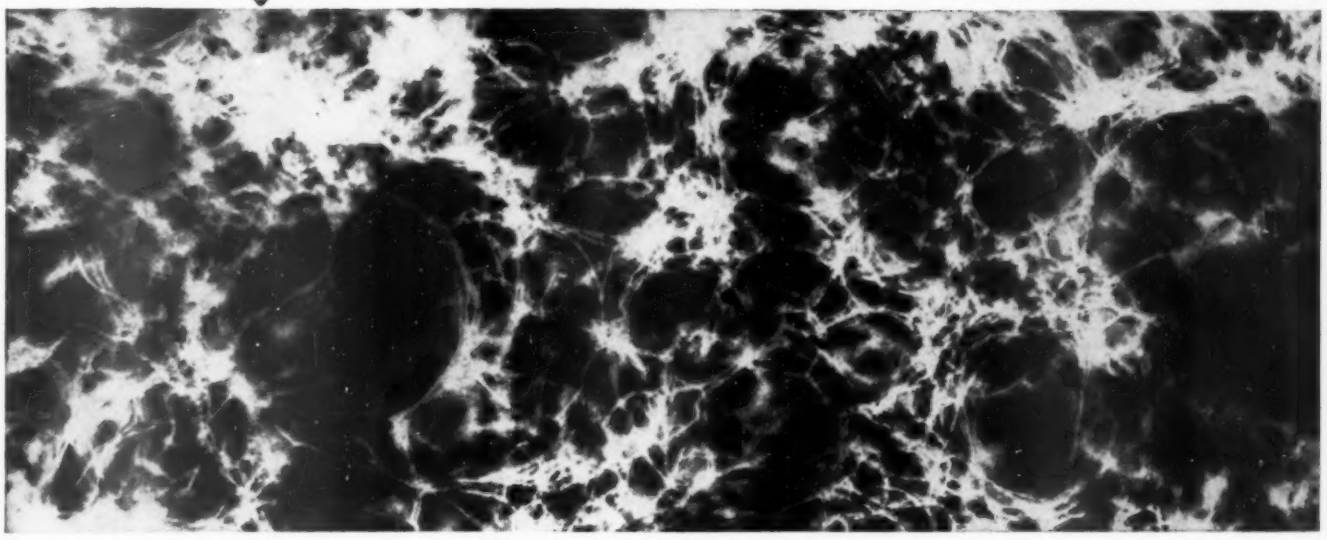


here blood enters . . . stops . . . clots . . .

Cross section of Gelfoam (highly magnified)



Hemostasis with Gelfoam sponge is efficient and direct: blood enters . . . stops . . . clots. Later, Gelfoam is absorbed *in situ* with virtually no cellular reaction.

Hospital applications for Gelfoam are many—so varied that one or more of its uses may occasionally be overlooked.

So that your hospital can take full advantage of Gelfoam versatility, make certain you have the right Gelfoam on hand for every use. Gelfoam is supplied as sterile surgical sponge, dental pack, prostatectomy cone, biopsy sponge, sterile powder, and Gelfilm* for neurosurgery and ophthalmologic procedures.

Indications and effects: Gelfoam is an absorbable hemostatic material useful in many fields of surgery. With it, capillary oozing or bleeding from veins may be controlled instantly. When implanted in tissues, Gelfoam is completely absorbed in 4 to 6 weeks without inducing excessive scar tissue formation; when applied to bleeding skin or mucosa, it liquefies in 2 to 5 days.

Administration: Using aseptic measures, Gelfoam is cut to the desired size and applied either dry or saturated with isotonic salt solution or with thrombin solution. The prepared Gelfoam is applied to the bleeding point and held there for ten or fifteen seconds. When bleeding is controlled, the Gelfoam is left in place.

Storage and handling: Gelfoam may be stored indefinitely in the unopened package. After opening, unused portions should be discarded or resterilized by dry-air heating for four hours at 290° F. (143° C.). Sterilization by autoclaving cannot be employed.

*Trademark, Reg. U. S. Pat. Off.

Precautions:
Gelfoam should be used discriminately in arterial bleeding because of the intra-arterial pressure. It is advisable to suture and reinforce where possible.
Do not rely solely on Gelfoam in patients with hemorrhagic dyscrasias.
Gelfoam will not stop menstrual bleeding—do not use post partum or for menorrhagia.
Be sure Gelfoam is in snug contact with all of the underlying or involved surfaces.
Use Gelfoam as sparingly as possible in observation of the surgical dictum regarding "as little foreign material as possible in wounds."
Do not overfill cavities.
Be sure that all air bubbles are expressed from the Gelfoam to discourage possible growth of aerobic organisms.
Do not use in grossly contaminated wounds — the Gelfoam may liquefy too rapidly.
Avoid prolonged exposure of Gelfoam to contaminated air.

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- control bleeding from small arterioles
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- seal cerebrospinal fluid leaks
- obliterate dead space
- secure a dry operative field
- protect brain surfaces during retraction
- carry medication
- stop epistaxis
- patch small air leaks in reinflated lungs
- reinforce suture lines
- treat gastroduodenal hemorrhage
- facilitate closure and healing of large kidney wounds
- control hemorrhage following anorectal surgery
- control bleeding and oozing in bone surgery
- promote healing in skin ulcers
- serve as biopsy sponge

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NEW MEMBERS

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The following ASHP members sponsored the New Members listed in this issue of the JOURNAL. The officers of the SOCIETY and the Committee on Membership and Organization appreciate the efforts of the individuals who have encouraged New Members to join the national organizations.

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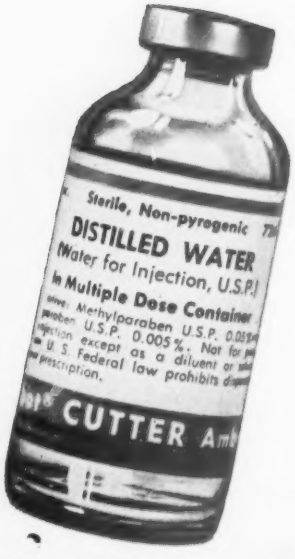

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"The widespread use of vitamin K in the newborn has changed what was once a major pediatric problem . . . into a matter of only academic interest."*

KONAKION provides the most efficient means of routine vitamin K prophylaxis: faster rate of absorption than menadione or its derivatives, wider margin of safety than vitamin K analogs; both oral and parenteral dosages (the parenteral form is a fine aqueous dispersion compatible with most intravenous vehicles). Not a single case of kernicterus due to **KONAKION** has been reported.

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A. J. Aballi, V. L. Banus, S. de Lamerens and S. Rozengvaig, J. Dis. Child., 97:524, 1959. And abstr. in J.A.M.A., 170:2249, 1959 and Nutrition Rev., 17:229, 1959.

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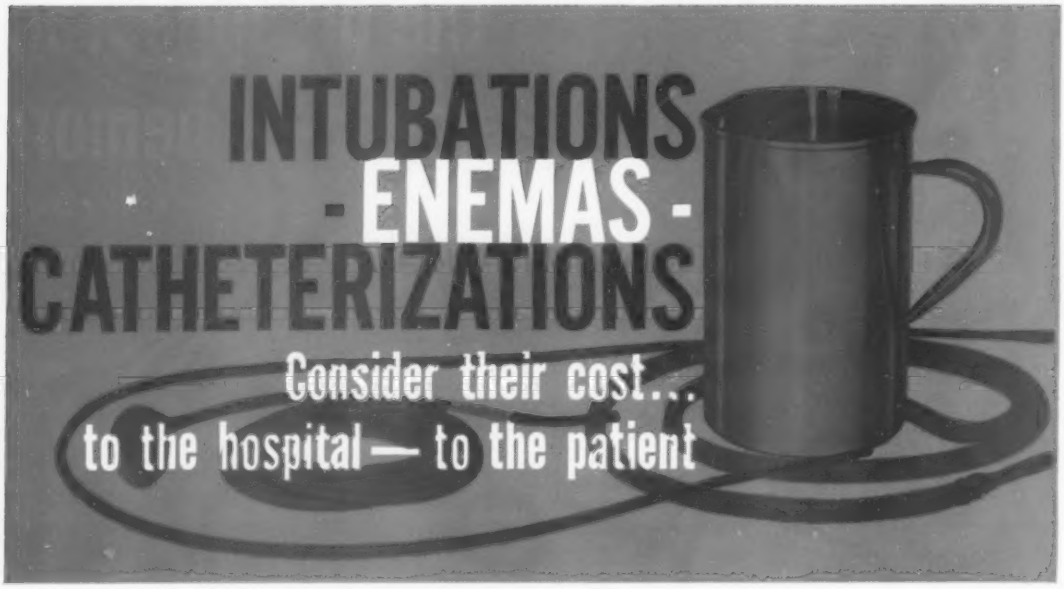

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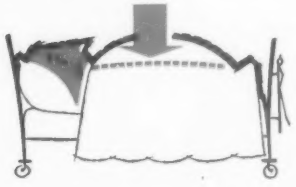

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1. Kareha, L.G. et al, W.Jour.S.O.&G., 66:220, 1958
2. Stone, M.L. et al, Amer.J.Surgery, 97:191, 1959

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easier labor

absence of untoward effects on mothers

almost negligible depressant effect on infants

In a series of 100 patients:

"Most parturients exhibited relief from pain within 5 to 10 minutes after injection. ...The average duration of analgesic effect was 4 to 5 hours..."[1]

"We gained the impression -- perhaps because the labors appeared 'easier' -- that duration of labor in many instances was shorter than usual. ...The obstetric team was united in ascribing to Numorphan analgesic properties superior to those of Meperidine, which we had previously used."[1]

In a series of 262 patients:

"None of the patients receiving Numorphan experienced nausea or vomiting or other untoward reaction. ...Noteworthy in this series has been...the almost negligible depressing effect on the infants. ...The routine use of Numorphan in obstetrical patients in labor is recommended as a safe and effective procedure."[2]

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1. Simecbova, M.; Shaw, W.; Pool, E., and Nichols, E. E.: Numorphan in labor, Obst. & Gynec. 16:119, July, 1960. 2. Snow, D. L., and Sattenspiel, E.: A report on Numorphan in obstetrics, presented at the Congress of the Pan American Medical Association, Mexico City, May, 1960.

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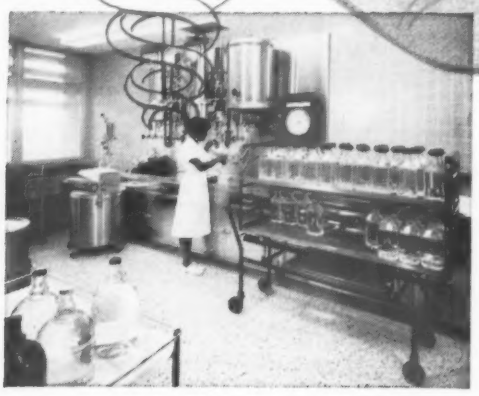

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It is well known that 75% of hospital solutions are used for external or irrigating purposes. The balance of course, are lifesaving parenterals. It's equally well known by hospitals currently benefiting from an Amsco designed and equipped Solution Preparation Room that these same External or Surgical Solutions... and many Parenterals ... *can be made at* <u>one-quarter</u> the cost of commercial solutions.

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- **Others produce only External Solutions . . . depending upon AMSCO LABORATORIES for <u>all</u> their Parenterals, Disposable Sets, etc.**

Why not ask your Amsco man to discuss an OBJECTIVE, correctly-balanced "Solution Program" for your hospital? It will be based *solely* on the specific solution needs, available floor space and your existing equipment. The results of our studied recommendations will involve minimum capital investment . . . and a significant decrease in your annual solutions costs.

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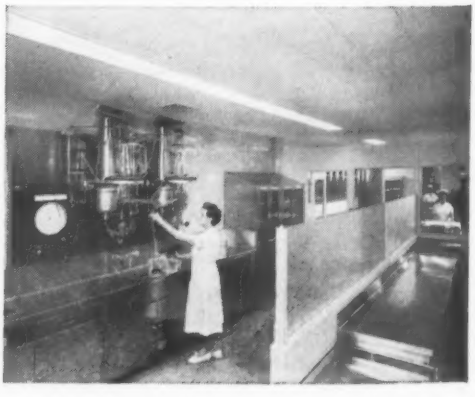

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Dear Sirs:

Appreciation for Bibliography

DEAR SIRS: You are well aware of the resolution adopted at the Annual Meeting of the SOCIETY held in Chicago, April 23-28, 1961, in reference to the Comprehensive Bibliography on Hospital Pharmacy. For the record, however, the following was adopted:

> *Whereas* the Fourth Supplement to the *Comprehensive Bibliography on Hospital Pharmacy,* published in the January, 1961 issue of THE JOURNAL, is an invaluable contribution to the armamentarium of the hospital pharmacists' references, now therefore be it
>
> *Resolved* that the members of this SOCIETY acknowledge this outstanding contribution to the coauthors and the Editor of THE JOURNAL.

I personally wish to express my appreciation for the fine continuing contributions which you have made over the years to the literature on hospital pharmacy and specifically for the several Comprehensive Bibliographies which have been prepared.

JOSEPH A. ODDIS, *Executive Secretary*
American Society of Hospital Pharmacists
Washington 7, D. C.

EDITOR'S NOTE: The Fifth Supplement to the *Bibliography on Hospital Pharmacy* will be published in 1962. This will include references to articles appearing in the literature during 1959, 1960 and 1961. Thereafter, it is hoped that a Supplement (covering the previous year) will be published annually. Preparation of the material for the Bibliography continues to be handled by Dr. William Heller of the University of Arkansas Medical Center, Little Rock, and by Gloria Francke, Associate Editor of THE JOURNAL.

Compliment

DEAR SIRS: I wish to compliment you on the fine editorial "Ethical Standards and Professional Conduct," which appeared in the June issue of THE JOURNAL. Perhaps, some day when we solve this problem, many others will be solved concurrently.

LOUIS P. JEFFREY, *Pharmacist-in-Chief*
Albany Medical Center Hospital
Albany, New York

Comment on Dr. Schou's Article

DEAR SIRS: I read Svend Schou's article with a great deal of sympathy but I am afraid that he is perpetuating the same old breast-beating and cry of, *mea culpa,* that I have heard for the last thirty years. Is there a morbid streak in all pharmacists? A compulsion to give his colleagues a "hot-foot"?

In reference to the 65 year oldster (I am not at that age, I only started early) wouldn't the member of any other profession have assumed that the oldster was unable to "sell" his administrator on the virtue of additional pharmacy personnel. Wouldn't it have been better to have studied his situation with him and brought influence to bear to change the thinking of his administrator?

Instead of turning our energies to self criticism why not direct them outward and attack some of the problems common to all? We stand or fall together—the other professions learned that lesson years ago. Why can't we?

Please, not another 30 years of this sort of thing.

D. E. BASTIAN
Box 372
Galesburg, Michigan

EDITOR'S NOTE: In his article "Our Professional Ethics" [AM. J. HOSP. PHARM. *18*:321 (June) 1961], Dr. Schou used the illustration Mr. Bastian objects to as an example of one extreme of hospital pharmacy practice which he observed in an earlier visit to the United States. Dr. Schou also praised highly the professional practice of the other hospital pharmacist he used as his contrasting example. In addition, he also gave numerous positive suggestions for attacking some of the problems common to all. Is not self-criticism one of the beginnings of knowledge—that upon which positive actions must be based?

"Lilly" Digest Available

DEAR SIRS: Many hospital pharmacists and administrators find the *Lilly Digest* summary of retail pharmacy to be of value in the management aspects of the pharmacy. To give them the opportunity to learn of the contents and availability of the latest *Lilly Digest* in your publication, enclosed is a set of page proofs.

Your readers may obtain a complimentary copy of the *Lilly Digest* when it becomes available for general distribution on or about September 1, 1961.

FRED C. HECKER, *Editor*
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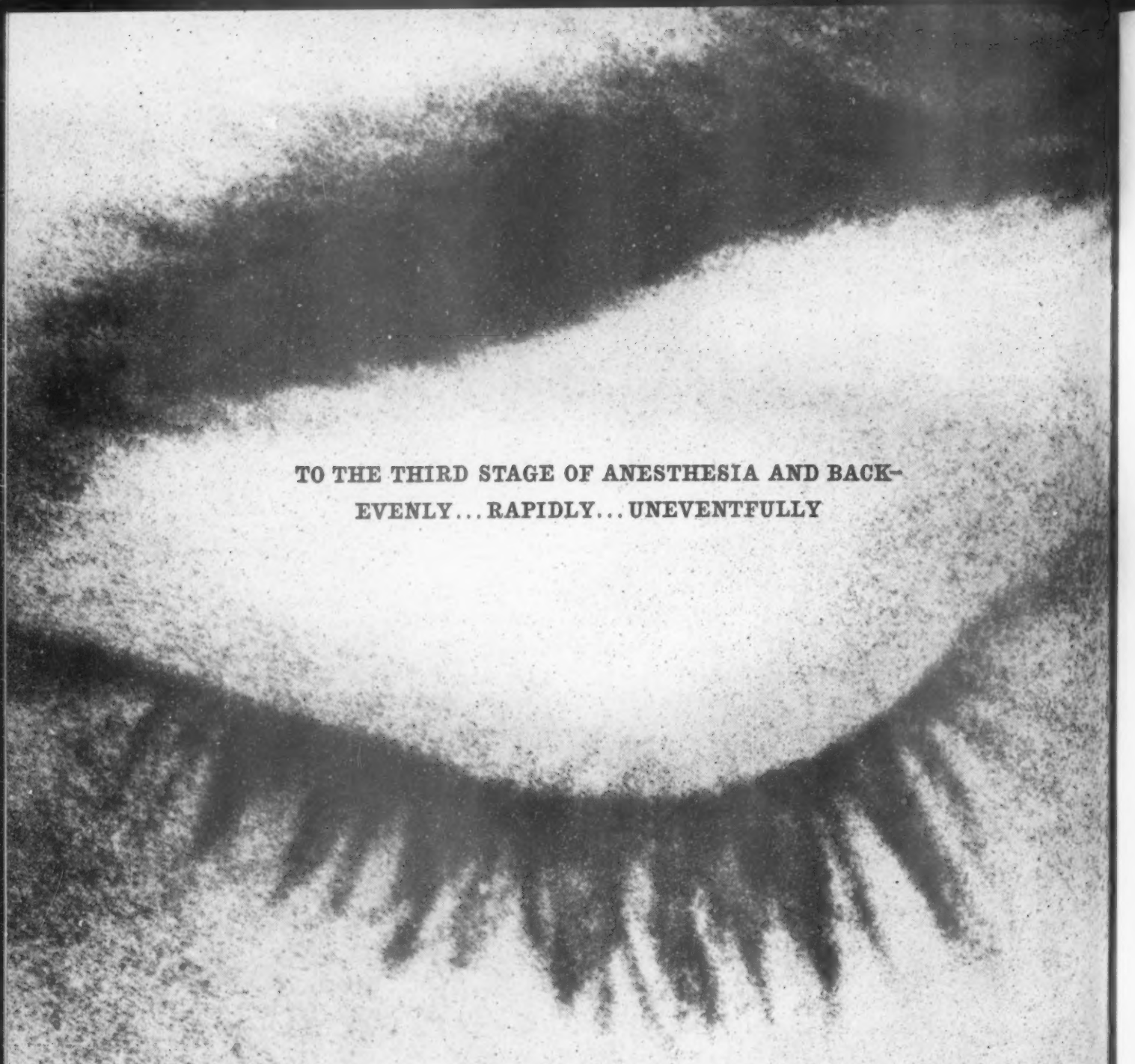

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EVENLY... RAPIDLY... UNEVENTFULLY

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ULTRASHORT-ACTING INTRAVENOUS ANESTHETIC From smooth induction to prompt recovery, SURITAL sodium (thiamylal sodium, Parke-Davis) provides specific advantages both for surgical team and patient. Adaptable to most operative and manipulative procedures, it assures a uniformly sustained plane of anesthesia, plus low incidence of laryngospasm and bronchospasm with minimal respiratory depression. And because SURITAL sodium rarely produces nausea or vomiting, it contributes significantly to greater patient comfort. See medical brochure for details of administration and dosage. 56761

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by DON E. FRANCKE

Changing Patterns in Dispensing

►TRADITIONAL METHODS OF DISPENSING DRUGS in hospitals are now undergoing complete reëvaluation. Several investigators are at work on this problem and there is little question that the results of their studies will revolutionize dispensing practices and procedures. We have brought together in this issue of the JOURNAL the results of several studies which point the direction of the changing patterns in dispensing.

These may be summarized along the following lines. First, there is the automation of dispensing using a vending machine located on each nursing unit. This is exemplified by the Brewer System described by Manzelli on page 560. A more complex automated electronic system is being studied by Dr. Mark S. Blumberg of the Stanford Research Institute in California (page 567). This device would replace handwritten record systems with computers which would give physicians' instructions to nurses, dispense a single dose of the prescribed medication from a vending machine, and record the drug prescribed and dispensed, and the name of the physician and patient. Virtually all drugs dispensed would be stocked in a dispensing device at the nursing station, in single-dose, labeled packages.

Another trend in dispensing is the decentralized or subpharmacy located on each floor or nursing unit. This system, also developed in California, is described on page 525. It provides the services of a pharmacist in the immediate vicinity where the drugs are prescribed and administered, expedites service and simplifies charging procedures. In effect, the system described by Simpson and Carner represents a new concept of hospital pharmacy practice—one that places the pharmacist in the center of patient-related activity and provides the setting for much closer professional relationships with physicians and nurses.

The third pattern taking shape is the dispensing of medication in single doses from the pharmacy, ready for administration by the nurse. Studies on this method have been carried out by McConnell *et al.* of Florida, Schwartau and co-workers in Minnesota, and Henry of Wisconsin. Results of two of these studies are published on pages 530 and 542. Of course this technic is also adaptable to a decentralized pharmacy and is, in fact, part of the system described by Simpson and Carner. This method relieves nurses of the task of preparing medication for administration and also simplifies billing. It represents a transfer of function from nurses to pharmacists.

An analysis of prescribing habits indicates that a relatively small number of drugs (20-50) account for over 90 percent of orders written on any one nursing unit. The manual recording and dispensing of standard drugs is costly. These procedures require significant amounts of time from physicians, nurses, and pharmacists. There is no question that improved methods of ordering and dispensing a large percentage of the drugs prescribed will be in widespread use soon. One may even safely predict electronic methods to aid the physician in selecting drugs with certain characteristic actions for patients with certain characteristic symptoms, taking into account the untoward effects of certain drugs and the contraindications of these drugs for given patients. However, in any system developed, the pharmacist will retain responsibility for the identity and quality of the medication dispensed.

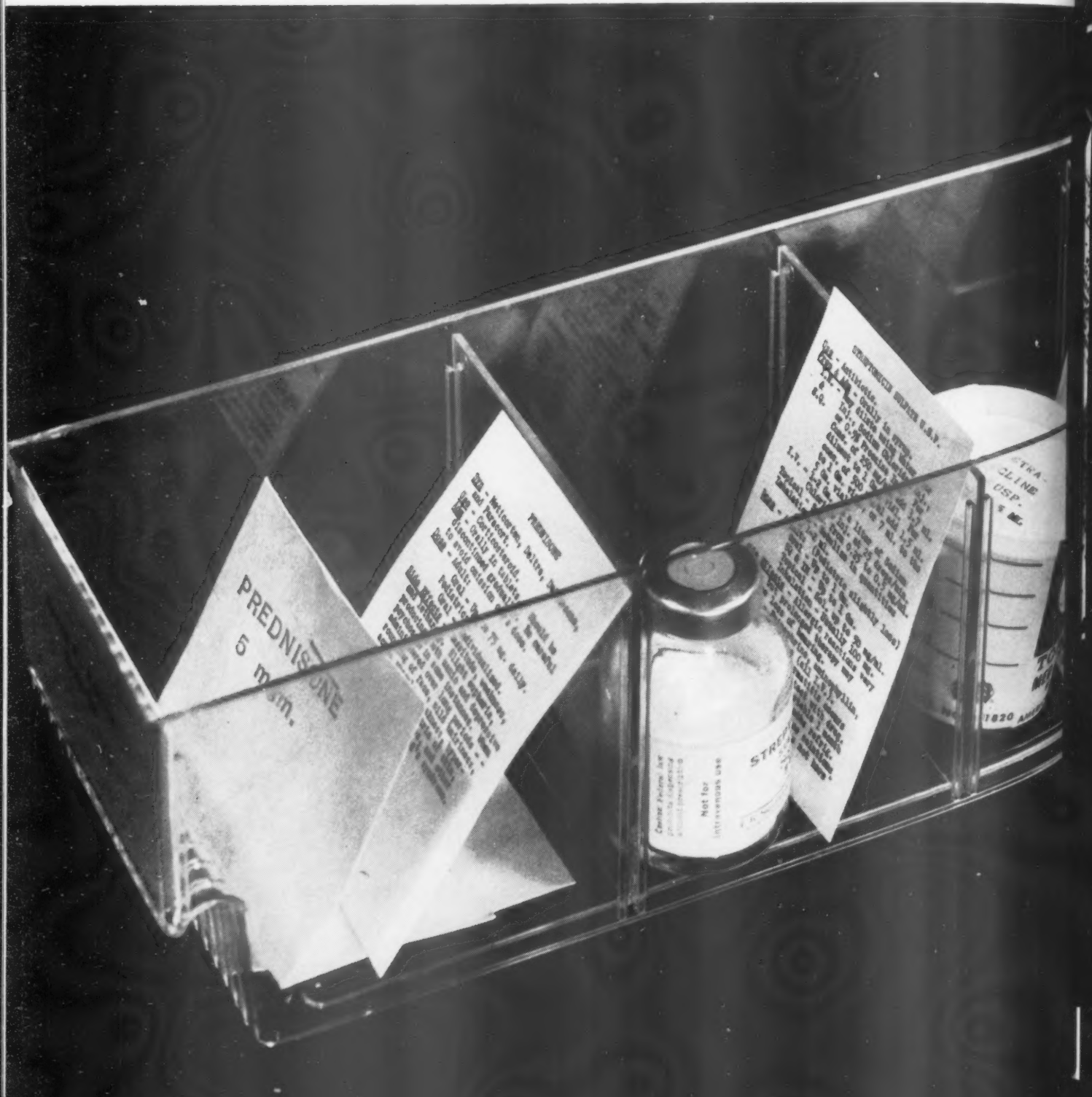
The dispensing of medication by the pharmacist in single doses ready for the nurse to administer brings into focus another consideration. Certainly, a pharmacist must supervise this procedure but should he personally be tied to such an activity throughout the day? We are speaking now principally of pharmacies with only one pharmacist. The pharmacist has too much to offer the hospital, there are too many other professional activities demanding his energies and attention to so occupy his time. Either he must have competent nonprofessional personnel to carry out these activities under his supervision or this function must not require so much of his time that he has no opportunity for other professional activities.

These changing patterns of dispensing can, by relieving the pharmacist of routine activities, open the way toward greater professional contributions. There is little question that a large percentage of hospital pharmacists have very heavy workloads, of which the dispensing function requires a large block of their time. Demands are so pressing in this area that little time is left to devote to the many other activities of the department. Many opportunities exist for the hospital pharmacist to strengthen and expand the other professional and scientific aspects of the practice of hospital pharmacy, to increase his teaching role in the hospital, and to carry out various types of investigation and research. In one of the reports of the Audit of Pharmaceutical Service given at the last convention, the statement was made that:

> The dispensing function of the pharmacist, while important and even vital, is essentially a superficial practice of the profession which, by itself, does not require knowledge or skills sufficiently basic to merit professional recognition *to the depth that lies within the grasp of hospital pharmacists.*

We recognize that much knowledge must underlie the dispensing of drugs and all that this implies. The main emphasis in this admittedly controversial quotation is on the routine, manual, time-consuming procedures of dispensing which keep the pharmacist from other professional activities which cry out for attention in every hospital. Undoubtedly, changing patterns in dispensing will lead also to changing patterns in the professional practice of hospital pharmacy.

SHOULD THE PHARMACIST ASSUME ADDITIONAL RESPONSIBILITIES FOR MEDICATION PREPARATION?



by WILLIAM M. HELLER

► SUPPOSE YOU HAD A PRESCRIPTION calling for tetracycline hydrochloride, penicillin G potassium, hydrocortisone sodium succinate, and potassium chloride in a flavored syrup. Would you send each of the drugs to the nursing division and expect the nurse to compound the prescription?

I think we all rise in righteous professional indignation at the very suggestion! What does the nurse know about the physical and chemical properties of these drugs and their possible reactions with each other and the flavored syrup which would influence their stability and potency? What does the nurse know of the techniques of compounding? What facilities and how much experience has the nurse for making the necessary measurements? How is her training in pharmaceutical calculations?

Of course, we all know nurses who, by reason of intelligence, education and experience, could successfully challenge us on most of these points. But the nursing division must be staffed twenty-four hours a day, seven days a week, through holidays, vacations, and sick leaves, and it is not unlikely that our unusually capable nurse will be off duty at the time we send up the ingredients for the prescription. The shortage of nurses being as great as it is, there may not even be a registered nurse on the division at that time and we may find a practical or vocational nurse assuming the responsibility for preparing this medication.

Disturbing thought, is it not?

Possibly you think it is so far-fetched that it is more ridiculous than disturbing.

Yet you and I and, as far as I know, every hospital pharmacist in this country, are asking our nursing services to do this every day, with one difference—instead of a flavored solution of sucrose as the vehicle, we send them a solution of dextrose and electrolytes. And instead of taking a teaspoonful orally four times daily, the patient is getting it by the liter directly into his veins.

Is it not inherently more dangerous to administer drugs intravenously than to give them orally? Does not the necessity for aseptic manipulations make the compounding of the intravenous preparation even more difficult?

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Presented at the Annual Meeting of the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS, April 23-28, 1961, Chicago, Illinois.

Have we pharmacists been blind to this? Some of us appear content to be small-time wholesalers, purchasing and sending on to the nursing division the original commercial packages of drugs. Most of us, at best, are only repackaging wholesalers who repackage commercial pharmaceuticals to a more convenient size for use on our nursing divisions and who compound a few of the more standardized noncommercial preparations which our nurses may need. Regardless, we leave to the nurse the responsibility for preparation of the individual dose.

The nurse assumes this responsibility by delegation from the physician. She is acting under his orders and direction and, theoretically, under his supervision. Acknowledging that this is the traditional, and legal, pattern in our hospitals, I strongly question whether it is the safest or most effective procedure.

Only the pharmacist is educated in pharmacy—the chemistry, physics, microbiology, and pharmacology of drugs. Thus, only the pharmacist can be expected to understand the chemical and physical reactions of drug and vehicle, the properties of chemical and bacterial preservatives, stabilizers, and carriers, all in relation to the use to which the drug is to be put. Neither the nurse nor the physician has the necessary educational background for this understanding.

The Pharmacist in the Middle

I propose we take the nurse out of the middle, and put the pharmacist in the middle of drug distribution in the hospital.

This means that—

1. orders for medication will be given by the physician to the pharmacist, not to the nurse;
2. the pharmacy service will initiate and maintain the necessary paperwork for control of drug administration; and
3. the pharmacy service will prepare each individual dose of medication and deliver it to the nurse or physician just prior to the time it is to be administered.

The Physician's Orders

Let's consider these points in order.

First, in this day of recording devices, we should be able to develop a means of oral communication between the physician on the nursing division and the pharmacist in the pharmacy which would contain the safeguards inherent in written communication.

Many of the problems involving drugs result from the physician's not knowing exactly which drug he wants to prescribe and how he wants it administered. The nurse cannot be expected to be of much help to him in this regard. The pharmacist, however, should know the drugs of choice for each condition, the limitations and advantages of the various dosage forms, which dosage forms are on hand and the other dosage forms which are commercially available or could be prepared in the pharmacy, and the economics of the various alternatives. How often, I wonder, does the nurse crush tablets instead of ordering a suspension; or give 1.7 ml. dosage or some other odd amount when the oral liquid could readily be diluted to contain the active ingredient in the more convenient 5 ml.?

This is the time—while the physician is communicating orally with the pharmacist—to get the name and the brand straightened out, to decide on the stop date, and to observe any other routines the medical staff, the pharmacy service, or the hospital might want to be met.

The Nurse's Paperwork

Everyone in the hospital field today decries the amount of time nurses spend away from the bedside of the patient, tied up in the paperwork of managing a nursing division. Much of that paperwork involves drugs.

Under present patterns, nursing service usually orders drugs from the pharmacy by three different methods, each with its own quota of paperwork: free floor stock, charge floor stock, and non-floor stock. Additional records are required for ordering, keeping an inventory and recording administration of narcotics and, in some hospitals, barbiturates and other special categories of drugs. Nursing service may be responsible for initiation or a portion of the processing of charges for drugs.

Most hospital pharmacists are aware of this pile of paperwork. Most of us, I suspect, are not familiar with the other records and forms nursing-service uses to control drugs on the nursing division.

In writing a medicine order for an inpatient, physicians rarely use the familiar prescription blank. Various hospitals have different methods, but usually the physician writes his drug orders to the nurse in a special drug order book or on a drug order sheet which is a part of the patient's chart. In many hospitals, however, the orders for drugs are not separate from other orders, and are intermingled with orders concerning diet, patient activity, and other aspects of patient care.

In any case, I think we pharmacists can readily appreciate the status of legibility and clarity of the usual physician's medication order. Yet in a growing number of hospitals it is not the professional nurse or even the practical nurse who takes these orders and sets up the nursing service drug records; rather, it is the ward clerk.

Some one in nursing service, then, assumes responsibility for interpreting the physician's order and puts it into a form which facilitates handling by nursing service. If it is a one-time-only dose, she may simply initial the physician's order and indicate that the dose was given.

When the order is for repeated doses of the drug, the responsible person in nursing service usually transfers the order to a medication card. A separate card is prepared for each drug and usually contains:

1. the patient's full name
2. his room number
3. name of the drug
4. dose to be given
5. times for administration
6. route of administration
7. date medication was ordered
8. stop date
9. name of person who prepared the card

These medication cards, which are often color-coded as to time or route of administration, may be kept in a compartmented container so that all of the cards of drugs scheduled for administration at the next hour are together. When the individual dose of medication is prepared, the card is removed and serves to identify the container until the dose is administered to the patient. The cards are then used as evidence that the drug was actually given and this fact is recorded on the nurses' notes or other designated place. In some hospitals, every dose of every drug is so recorded as having been given. Obviously, this is a very time-consuming procedure. In other hospitals, only the more potent drugs are recorded and it is simply assumed that the drug has been given as long as the physician's order is still in effect.

After recording, the medication card is returned to the compartmented container and placed in the compartment designated for the time of the next dose.

If the physician gave his drug orders directly to the pharmacist, all of the nurse's paperwork involved in ordering drugs from the pharmacy could be eliminated. Centralization in the pharmacy of the controls necessary to insure that each dose is prepared and delivered at the proper time should permit greater efficiency, even mechanization of this paperwork. Charging and crediting drugs should be much more accurate.

In talking to your nursing service about this idea, you must be certain they understand what you are saying. There is the story of the little niece of the pharmacy secretary who came in on the secretary's day off and picked up her aunt's paycheck. A short time later she rushed back and breathlessly announced "I've lost my aunt's pay! I've lost my aunt's pay!" Her excitement agitated the pharmacist and he admonished her to stop talking "Pig Latin" and tell him what was wrong!

It is perfectly plain what we are saying here, but there will always be some who will try to make something out of it. We need especially to be certain that nursing service understands. We are proposing that pharmacy assume all of the responsibilities for drugs up to the point and time of administration. This leaves nursing service with responsibility for (1) administration of the drug, and (2) observation of the patient's response to the drug. Of all the responsibilities nursing service has for drugs, I believe this last is the most important and is the function on which nursing must place increasing emphasis. The potency and complexity of modern drugs does not permit 24-hour waits until the next visit of the patient's physician. The nurse must be aware of the desired and undesired effects and be prepared to notify the physician immediately when indicated.

Medication Preparation

The preparation, labeling and delivery of each individual dose appears to be a monumental task for the pharmacy to undertake. But remember that this is being accomplished *by someone* in each of our hospitals all the time. We buy milk of magnesia by the gallon or make it by the fifty-gallons and think we have gone a long way in providing the nurse with a more convenient size by packaging it in pints. But why not omit this step and package it in the dose sizes most likely to be administered?

Some hospital pharmacists have already made progress in this area. Bogash and associates have reported on their strip-packaging of tablets and capsules. In this afternoon's session of this meeting, Barker, McConnell and Garrity will report on a study of unit-dose dispensing. Schwartau has completed a pilot study of certain aspects of unit-dose dispensing.

Some pharmacists dilute drugs for injection, such as penicillin G potassium, before dispensing them to the nursing division. Why not go one step farther and dispense them in a syringe or cartridge injection unit ready to inject?

Pharmaceutical manufacturers will no doubt offer many more items in unit-dose form. Considerable progress has already been made with injectables.

It would appear that any discrete dosage form could be prepackaged and delivered to the nursing division as needed. Items for which the dosage is somewhat vague, for example lotions and ointments, may not readily lend themselves to unit-dose dispensing.

It is conceivable that unit-dose preparation and these related activities could be carried out by pharmacists stationed on one or more nursing divisions and performed in much the same manner and with the same procedures as are now used by nursing service. However, centralizing these functions should permit mechanization of many activities and the development of streamlined procedures.

Research Needed

It is my purpose here today to stimulate your thinking along these lines, to urge you to consider what can

be done in your hospital to effect these ideas, and to begin research on some of the techniques and procedures for accomplishing these aims. If we pharmacists refuse this challenge, the nurse is doomed to an ever increasing mound of paper work as drug therapy becomes even more extensively employed. And as the nursing shortage becomes ever more acute, these fundamentally pharmaceutical activities will be performed on the nursing division by sketchily trained medication technicians and clerks.

Staffing of Pharmacies

Assumption of these functions by hospital pharmacists will bring revolutionary changes to the practice of pharmacy in this country. The presence of a pharmacist in the hospital at all times will make the pharmacy service much more important in administrative and in patient care activities.

The number of pharmacists required to staff hospitals under this system would be astronomical compared to present staffing. To keep one pharmacist on duty round-the-clock requires a minimum complement of five pharmacists. For our 450-bed hospital, I have prepared a budget calling for thirty pharmacists and I fear I have been too conservative in estimating our needs. In big, round numbers, we can estimate a need for 50,000 more pharmacists to serve our present hospitals under this proposed system.

While it is true that there is currently a shortage of pharmacists if pharmacists are expected to maintain pharmacies on all the corners in America from which they have served in the past, it must be admitted that there would be a surplus of pharmacists if they devoted all of their time to professional activities. They branch out into nonprofessional activities primarily for economic reasons. By increasing salaries, hospitals should be able to obtain as many pharmacists as they need, and the community pharmacist's contribution to public health need not be endangered since he can delete the nonprofessional activities from his daily work. Increasing salaries cannot produce overnight a significant number of new nurses or new physicians. In fact, except for pharmacy, almost all professional and technical workers in the health sciences are in short supply.

Effects on Pharmacy Profession

What are some of the long-range prospects resulting from our assumption of this challenge?

It is conceivable that the majority of pharmacists will be practicing in hospitals, nursing homes, and group practice situations. This means that few pharmacists will be owners of their own pharmacies. The ambitions and motivations of pharmacists are bound to change as more and more of them become employee pharmacists.

When the hospital pharmacist gets in the middle and physicians realize how much the pharmacist knows about drugs, especially the selection and preparation of dosage forms, the pharmacist will become the most important person in drug distribution and be subjected to the overabundance of advertising, pressure and "help" that the physician endures now.

On the other hand, once pharmacists become involved again as compounders, we will discover how ignorant we are of the pharmaceutics of the newer drugs. The result should be a healthy demand on manufacturers for pharmaceutical information as well as medical information.

The ensuing concentration of pharmacists in hospitals should have great effects on pharmaceutical education. Of course, the current retail-oriented course content would need much modification. But the greatest effects on pharmaceutical education could come from the use of a relatively few hospitals to provide clinical experience for undergraduate pharmacy students. The graduate pharmacist could be given well-controlled internship and residency experience organized in the same manner as post-graduate experience in medicine is obtained. Think for a moment of the value to a pharmacist-intern of being in constant communication with physicians as they select and direct the use of drugs!

Conclusion

Viewed against the current practices of hospital and retail pharmacy, this proposal sounds fantastic. I can only reiterate that somewhere between the manufacture of a drug and its administration to the patient, someone is performing each of these functions. That someone is not always the person best qualified. Pharmacy as a profession is not assuming obvious responsibilities. When we shirk, it is usually the nurse who takes up the slack. When physicians shirk, it is usually the nurse who takes up the slack. Now the professional nurse has become overwhelmed and she in turn has had to pass responsibilities on to practical nurses, aides, orderlies and ward clerks.

The most magnificent future of pharmacy lies in our hospitals, in the hands and minds of hospital pharmacists as they accept their role in the middle where they belong. The profession of medicine will benefit as physicians learn they have a knowledgeable and reliable professional partner to help them with drug therapy. Nursing will improve as the nurse can forget about arithmetic and incompatibilities and avail herself of the time to observe the patient for the wanted and unwanted actions of the drugs she has administered.

The person most benefited will be the patient, for each of the members of the health team will be caring for him to the full extent of his professional capacity.

Dispensing Medications from Decentralized Pharmacy on Nursing Floor

MEMORIAL HOSPITAL
(LONG BEACH, CALIF.)
DECENTRALIZED PHARMACY

by CLAUDE SIMPSON *and* DONALD C. CARNER

► THE TREMENDOUS OUTPOURING OF NEW DRUGS resulting from unprecedented research forged a new role for the pharmacist at the entirely new 400 bed $10,800,000.00 Memorial Hospital of Long Beach, California. In this modern general hospital, currently employing 10 registered pharmacists, dispensing medication has been brought directly into the doctor-nurse-patient area. The pharmacist has taken over responsibility for some phases of drug administration formerly carried solely by the registered nurses.

The purpose of this article is to briefly review the reasons behind this step and to evaluate its effectiveness.

It has become increasingly difficult for the "medication nurse" to keep pace with the fast stepping pharmaceutical houses. Not only have new drugs been produced more rapidly than ever before, but their effect upon the patient frequently causes them to be classified as dangerous drugs. Busy practitioners of medicine are also hard pressed to have first hand knowledge of all new drugs. It seemed to us that this called for first

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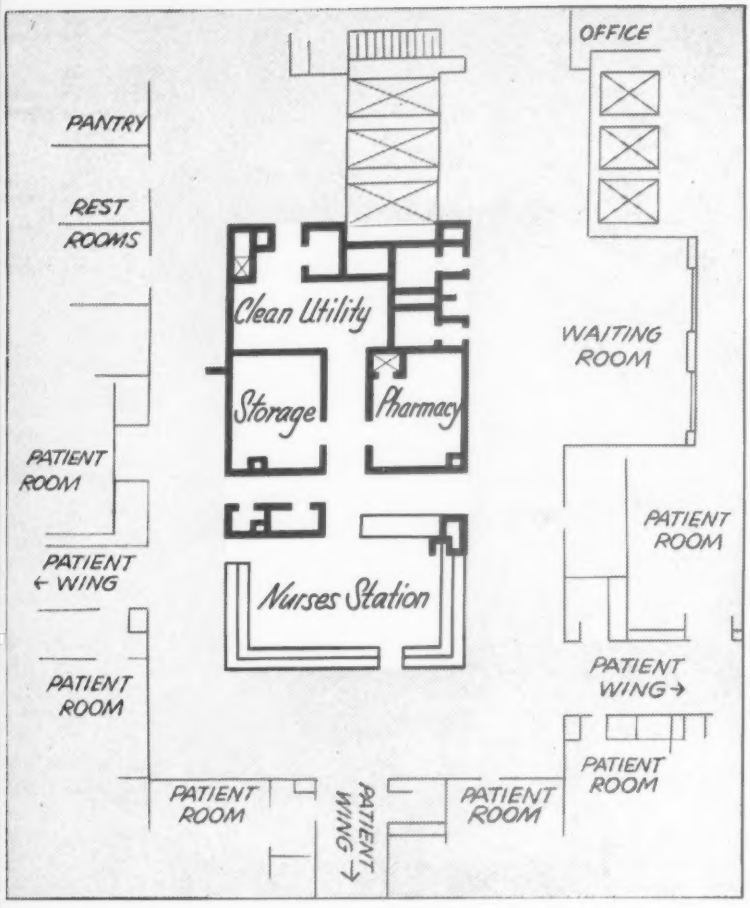


Floor plan showing location of nursing station and pharmacy

hand contact between the doctor, nurse and pharmacist.

We had to face the fact that there would be a substantial increase in payroll costs when the $9,000.00 per year pharmacist partially replaced the $4,300.00 per year medication registered nurse on the nursing floor. Neither could the nationwide shortage of competent hospital pharmacists be ignored.

On the other side of the coin, it seemed certain that patients would be assured treatment involving the most up-to-date medication administered with the greatest possible accuracy and minimum possibility of error.

It was also anticipated that the "medication nurse" would be able to devote more time to patients at the bedside while administering drugs. We were hopeful that extra nursing time used in this manner would be particularly beneficial to patients. There was also good reason to believe the added cost would be largely offset by greater attention paid to handling drugs and to processing charges for these often costly items. What is the outcome?

Results of New Plan

The new concept has been in effect a full year in which more than twenty thousand patients received care. During this trial period only one nursing station was equipped and staffed by pharmacists. This was due

Lower Level Store Room and Electric Supply Elevator

MEDICATION PROCEDURE

Routine Medications

1. The charge nurse removes the carbon copies of the physician's order sheet, circles the medications ordered, stamps it with the patient's charge-plate, and sends it to the pharmacy.
2. The pharmacist makes out the medication card, sets up the medication cart or tray, enters on the charge slip the per dose charge, and files the charge slip.
3. When an order is discontinued the nurse will erase the note from the Kardex and will give the pharmacist the two copies of the order to discontinue the medication. The pharmacist marks the medication card with the order and time of discontinuance in red, and gives to the medication nurse for charting.
4. After a patient's discharge order has been written the nurse will notify the pharmacist by sending the carbon copy of the order to the pharmacist, who will remove the accumulated charge slips from the file and will send them to the cashier's office. The nurse will send the cashier's copy of the discharge slip to the pharmacist. At the time the patient leaves the hospital, the nurse gives the fifth copy of the discharge slip to floor pharmacy. The pharmacy proceeds with the medicine cards in the same manner as discontinued orders.
5. If a patient is transferred or deceased only the fifth copy of transfer slip is sent to floor pharmacy.

P.R.N. Medications

1. For the initial order the nurse will follow the procedure No. 1 for routine medications.
2. When a p.r.n. medication is to be given the nurse will check the chart to make certain that the medication may be given. She will then originate a medicine card and give the card to the pharmacist to fill. The pharmacist will give the medication with the card to the nurse. The nurse charts from the medicine card and then destroys it.

"Stat" Medications

The nurse will follow the Routine Medication procedure Steps 1 and 2. The nurse will keep the card for charting and then destroy it.

Responsibilities of the pharmacist will be to:

1. Restock all commonly used medications and all medications which must be obtained from the main pharmacy.
2. Order and procure medications not stocked in the floor pharmacy from the main pharmacy.
3. Narcotics will be refilled by medication nurse; hypnotics will be refilled by the floor pharmacist.
4. Have all medications ready for administration so that they can be administered within one-half hour before or after the time ordered or according to the following hours:

   o.d. = 9 a.m.
   b.i.d. = 9 - 6
   t.i.d. = 9 - 1 - 5
   q.i.d. = 9 - 1 - 5 - 9 (10-2-6-10-Dr. C. G. Johnson)
   q 6 h = 12 - 6 - 12 - 6
   q 12 h = 9 - 9 (8-8-Dr. C. G. Johnson)
   q 4 h = 9 - 1 - 5 - 9
   q 3 h = 9 - 12 - 3 - 6
   q 2 h = 8 - 10 - 2 - 4 - 6 - 10
   p. c.) to be determined by serving times
   a.c.) 8 - 11:30 - 4:30

5. Restock all emergency drugs and sterile equipment used from the emergency box. Return equipment from emergency box to CS for resterilization as directed by that department.

Responsibilties of the Nursing Department will be to:

1. Note promptly all orders, sign the physician's order sheet, and give requests to the pharmacist.
2. Transfer order to the Kardex.
3. Check charts for 72-hour stop orders on dangerous drugs and notify the pharmacist of the expiration of the order.
4. Remind the physician of any orders which need to be rewritten.
5. Note whether p.r.n. medications may be given before asking the pharmacist to fill the request (elapsed time, needs of the patient, condition of the patient, etc.)
6. Chart promptly all medications, routine, "stat," and "p.r.n."
7. Keep the Kardex up-to-date so that it presents an accurate, current record of all medications being administered. Medicine cards will be checked with Kardex at the beginning of each shift.
8. Record promptly all narcotics administered on the patient's chart.
9. Charge for all emergency drugs used from the emergency box.

   Cross out the top copy of each section of Physician's Order Sheet that has not been used. The carbons for this partially used section have been sent to pharmacy.

Central Pharmacy Entrance and Display Window seen from lobby

in part to a desire to "make haste slowly," and partly to the continued shortage of registered pharmacists in California.

As anticipated, doctors welcome having a pharmacist at the nursing station when they are pondering the course of treatment and writing orders. Nurses want more. They want to extend duty hours in the floor pharmacy from 7:30 A.M. to 3:30 P.M., to midnight. They would like to see heavier staffing in the peak morning hours. Other nursing units look forward to the day when their pharmacy will be in operation. Patients welcome the extra nursing time. They also have benefited by receiving medications at lower cost as charges for doses are accumulated. Often this results in quantity prices to the patient. This process also aids the business office as pharmacy charges need only be posted once for each patient instead of singly as each item is issued.

The entire pharmacy operation includes the ground level store room, first floor central pharmacy and four decentralized sub-stations on the nursing floors. All are in a direct vertical line connected by both electrically operated supply elevators and an electronically guided pneumatic tube system. Telephones and intercom aid verbal communication.

The last item also offers some problems as the patient sees one combined charge on his bill instead of numerous small items. In case of late charges, this can be disconcerting. While instituting the decentralized pharmacy, we also began to use a simplified three-part physicians' order form which eliminates charge slips and considerable other rewriting by the nurse. All of the "bugs" in this form have not yet been resolved so that we still have some difficulty with legibility and occasional errors in the use of charge plates.

Of considerable importance is the record of having only four medication order errors in this nursing unit which provided care for over 5,000 patients during the period under study. The majority of these patients were "medical," seriously ill, and required extensive medication. One error is charged to the pharmacist, the other three being nursing.

Economically, we are satisfied that the added cost in wages is fully justified by having the pharmacist available and offset by a more efficient operation.

Although not directly related to the decentralized pharmacy, this article would not be complete without reference to the fact that the hospital also instituted 'round-the-clock staffing of the central pharmacy. For the first time in the history of the city, 350,000 people now have access to a qualified pharmacist at any hour of every day and night. Concurrent staffing on this broad basis required some of the time of skilled pharmacists which otherwise would have permitted more rapid progress in the decentralized units.

In summary, the trial period has served its purpose well. The new concept has proven itself and will be extended as rapidly as pharmacists become available.

Decentralized Pharmacy
DETAILS OF OPERATION

I. Hours

A. Decentralized Pharmacy Hours - 7:30 a.m. to 3:30 p.m.
   1. Night medicines, e.g. cathartics and hypnotics, from floor supply.
   2. Main Pharmacy - in-service to all departments, 24 hours.

II. Communications

A. Intercom system between medical units and pharmacy.

III. Pharmacist trainee program with experienced pharmacist

A. Chart interpretation.

B. Cost procedure based on dosage unit.

IV. Procedure

A. Carbon copy of physician's order (charge slip), with medications indicated, is given to pharmacist, together with medication card.
   1. Pharmacist fills envelope with medication ordered and puts in patient's box.
      a. On routine orders, a sufficient amount is dispensed for several days.
      b. Number of doses dispensed is indicated on charge slip.

B. At designated times, according to medicine cards, medication is set up on medicine cart.
   1. One cart for each wing of 20 rooms.
      a. Separate medication nurse for each wing administers the medication as set up by pharmacist.
   2. Usual times for setting up medications are: 8 a.m., 9 & 10 a.m., 12 noon, and 1 & 2 p.m.
   3. Medications ordered for irregular times and "stat" medications are set up as ordered.
   4. As pharmacist sets up medications, he makes certain that there are sufficient doses left in patient's envelope to last until next morning.
   5. When envelopes are refilled, the number of doses dispensed is again recorded on patient's charge slip.

C. Upon notification of discharge, the patient's charge slips are pulled from file, charges entered for number of doses used, and slips sent to cashier.

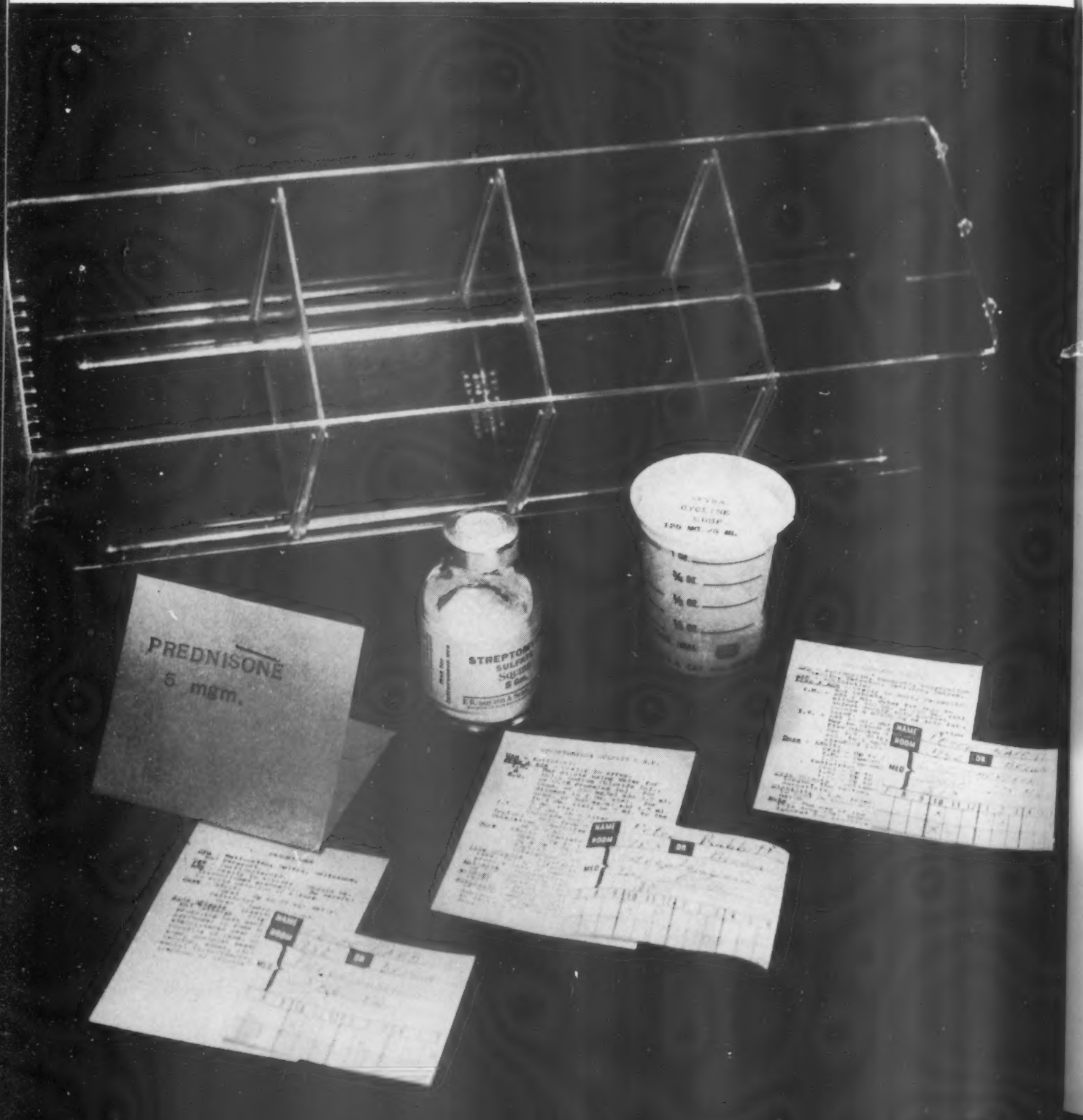
Pharmacist using Pneumatic Tube System

Electrically Operated Supply Elevator

Central Pharmacy Counter with Supply Elevator in background

CENTRALIZED UNIT-DOSE

Single doses of medications are dispensed to the wards



DISPENSING

report of a study

by WARREN E. MCCONNELL, KENNETH N. BARKER *and* LILLIAN F. GARRITY

► DRUG DISTRIBUTION—THE PHYSICAL TRANSFER of drugs from their storage area in the hospital to the patient's bedside—is generally regarded as the prime function of the hospital pharmacy department. The means by which this process is accomplished are practically unlimited if all the refinements and innovations which have been developed in different hospitals for this purpose are taken into consideration. Viewed broadly, however, contemporary drug distribution systems can be classified under either one or a combination of two general types: (1) the complete floor stock system, or (2) the individual patient prescription system.

In the complete floor stock system all except the most expensive or rarely used drugs are stocked in bulk quantities at the nursing station. In the individual patient prescription system, practically all medications are supplied on individual order or prescription. Each of these systems has its inherent advantages and disadvantages. These have been clearly enumerated by Heard[1] in his discussion of inpatient dispensing in hospitals.

Distribution systems comprised of elements from both of the foregoing general methods may have more or less of the advantages and disadvantages attributed to the individual methods. Regardless of the system employed, however, there are several problems which continually confront the hospital pharmacist in his attempt to develop a system best suited for his institution.

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Medication Errors. Obviously, any system used should give first consideration to this problem. The studies of Safron,[2] Corcoran,[3] and the reports of the ASHP Committee on Safety Practices and Procedures, all indicate that medication errors are much more frequent than previously supposed, though causation has not been clearly defined.

Conserving Nursing Time. "Getting the nurse back to the bedside" is a problem currently under discussion by nursing leaders everywhere. Some have stated they would welcome the opportunity for the nurse to be relieved of the preparation of medications in order to achieve this goal of better bedside nursing care. The nurse's role in the drug distribution process will most certainly bear on how her professional time is expended.

Conserving Pharmacists' Time. Though the role of a pharmacist in the dispensing of commercially prepared, ready-to-use, dose forms is to assure that the correct medication is dispensed in the correct manner, many drug distribution systems still have pharmacists filling many "count and pour" prescriptions. Such routine tasks can be performed by nonprofessional personnel with the pharmacist being more efficiently employed to supervise and check the end-product. Refinement and adaptation of properly controlled "assembly line" production in the pharmacy may point the way to more efficient use of professional personnel.

Preparation of Medication for Administration. In many hospitals, "pouring medications" is done in areas of heaviest traffic where the nurse is subject to frequent interruptions. In too many cases, the nurse pouring medications is entirely unsupervised and no provision is made for checking prepared doses. In almost any hospital this routine could be upgraded from the efficiency and safety standpoints.

Transmission of the Medication Order to the Pharmacy. In the majority of hospitals, all or most of the requests for medications received by the pharmacy have been previously interpreted from the order sheet by a third person, usually a nurse. Recognizing this source of medication errors, Heard[1] introduced the idea of using a copy of the chart order sheet which was

sent to the pharmacy with no intermediate transcription. This system, and the one where original prescriptions written by the physician himself are sent to the pharmacy, are two methods which largely obviate the problem of errors in transmission of medication orders to the pharmacy.

Drug Information for Nurses. Though nurses are frequently supplied with bounteous quantities of information about drugs, too often the material is in the form of manufacturer's literature, reference texts, etc., not readily suitable for routine reference at the time of administering the medication. Too frequently nurses learn about undesirable side effects only when they occur after the drug has been given.

Preparation of single dose

Review of the Literature

Little has appeared in the literature on the subject of drug distribution systems, *per se,* though countless articles have dealt with related subjects. One of the earliest reports[4] on the subject appeared in 1940 wherein the author stated that in her hospital (daily census 80) all doses of medication were prepared in the pharmacy under pharmaceutical supervision. Hypodermic drugs were sent to the floor at 7:00 P.M. and returned the next morning. It was also reported that the methods had become routine and worked very well, and that, in the author's opinion, it should be possible to place the plan in operation in large hospitals.

In 1947, Flack[5] suggested that part of the pharmacy's responsibility should include the dilution of all injectables, provision for and supervision of the delivery of the medications to the nurses, and the issuing of printed procedures and instructions to nurses.

Collins,[6] in 1954, described methods for speeding up dispensing service in the hospital and made the recommendation that prescriptions for compounding be filled in a separate department *away* from assembly line dispensing. Parnell and Sutton[7] discussed the general advantages of central distribution in the hospital in 1955. The next year, Zugich[8] described two new methods of drug distribution, these being the drug folder system developed by Godley, and the complete floor stock system as developed by Beck at the Indiana University Medical Center.

Probably the most comprehensive discussion of drug distribution was the one presented by Heard,[1] in 1958. He divided inpatient dispensing systems in the United States into three general categories: (1) complete floor stock, (2) the patient prescription system, and (3) various combinations of these two. Of prime importance for consideration was Heard's list of controls necessary with any system.

In 1959, Teplitsky[9] sent questionnaires to chief nurses in 49 states receiving 111 (85 percent) replies. Of special interest is the list of suggestions made by

Inspection of single doses which are being dispensed

nurses regarding the distribution of drugs in hospitals. In the same year, Johnson,[10] speaking on the rights and liabilities of the hospital pharmacist, listed several "antidotes to liability," among which was the centralization of control over the total pharmacy function in the hospital.

Brodie,[11] in 1960, discussed quality control in the hospital pharmacy and in a paragraph on dispensing controls described 13 features which can very well form the basis for good qualitative control at the dispensing level.

Development of the Study

A careful analysis of the existing literature on drug distribution systems and related topics, as well as careful consideration of how best to solve, minimize, or eliminate each of the major problems confronting any drug distribution system, led to the hypothesis that the system which we have termed "centralized unit-dose dispensing" should offer more advantages and fewer disadvantages than other reported systems.

Definition. Unit-dose dispensing, as defined by the authors, is the preparation for administration of all doses of inpatient medication *practically* possible by the pharmacy, while at the same time maintaining the traditional pharmacy functions and responsibilities associated with the use of drugs in the hospital. Within the confines of this definition, two general methods of implementing unit-dose dispensing have been suggested: (1) decentralized unit-dose dispensing in which the medication is prepared by a pharmacist on each nursing floor, and (2) centralized unit-dose dispensing in which all medications are prepared in the pharmacy. Although various combinations of these two extremes are possible, none has been reported.

Hypothetically, a centralized unit-dose dispensing system should significantly reduce the number and magnitude of most of the previously enumerated problems connected with contemporary drug distribution systems. Such a system should answer satisfactorily

the following questions chosen as basic to an ideal drug distribution system: (1) *Safety:* Will the system protect the patient from medication errors? (2) *Efficiency:* Will the system provide for best utilization of professional time? Will it be economically practical? (3) *Accuracy of Accounting:* Will the system account for all medications with accuracy, reducing pilferage and deterioration costs to a minimum? A fourth objective which might be added is that of establishing within the framework of the drug distribution system an effective drug information program for nurses. This objective might very well be considered as a part of the first criterion above.

Basic Premises. In considering the overall problem of drug distribution, the authors had initially agreed upon two premises regarding distribution systems in general. The first is that drug distribution is a joint responsibility of the pharmacy and nursing professions. The basis for this premise is the absolute necessity that the drug distribution system function correctly in the interest of patient safety. It is proposed that the most practical means of obtaining the complete cooperation of each member of each profession is to attempt to arrive at compromise solutions to problems which will receive not only the acceptance but the voluntary support of both groups. In the interest of patient safety, both professions should feel a moral responsibility to cooperate in order to prevent any malfunctioning of such an important part of patient care and safety. Naturally, important principles of safety must not be seriously compromised, but, on the other hand, when the choice becomes that of a compromise policy well received and energetically practiced, compared to an academically correct but autocratically dictated rule which is given lip service and little more, the best choice in most instances lies with the former.

The second premise is that the ability of the average nurse to assimilate and recall all the information necessary for the safe and rational administration of drugs has been, or will be, surpassed in the near future. One solution to this problem is in the use of specially prepared routine references. Such references should *not* be in a form written expressly for physicians, as, for instance, most package inserts and many reference books. These are not adequate for *routine reference.* The information is usually too complex and detailed. Many aspects are extensively covered with which the nurse has no *immediate* concern. Although nurses can usually extract the pertinent information from such references (given enough time and the occasional help of a medical dictionary) in such a form it requires too much time and effort on the part of the already busy nurse to make it practical for routine use. The not-so-conscientious nurse usually will not bother, and it is a frustrating atmosphere in which to require the conscientious nurse to practice.

In assigning the responsibility for providing routine references for nurses, it is difficult to find anyone better qualified by training, experience, and central location than the hospital pharmacist.

Scope of the Study. It was decided to evaluate a centralized unit-dose dispensing system on the pediatric floor (35 beds) of the University of Florida Teaching Hospital (250 beds). Data would be in the form of time study results, tabulated replies to a series of questionnaires given to participtaing nurses, and tabulated records of medication errors observed in the pharmacy. Extensive subjective observations would be made and recorded on the entire pharmacy operation.

The decision to limit the scope of the study in this manner was arrived at for several reasons: (1) Available research funds were not adequate to support a full-scale hospital-wide sample considered necessary for valid measurements of the pharmacy operation. (2) Evaluation of the system from the nursing aspect could be made on a relatively smaller scale than could evaluation of the pharmacy operation; that is, one patient floor would provide sufficient data for a meaningful interpretation of the results. (3) The question of the amount of nursing time saved by unit-dose dispensing is vital to justification of the more complex pharmacy operation. (4) Such a study as outlined would serve as a pilot study providing valuable insight into the problem before investing more money in a broader research study. (5) The experience of maintaining two separate dispensing operations (one experimental and one control) could be obtained relatively inexpensively with the study of more limited scope.

Experimental Procedures

Pharmacy Operation. No data were compiled on the pharmacy operation other than those related to the special routines established to check for medication errors. Observations were made, however, on the pharmacy operation in general.

For three months prior to the initiation of the unit-dose dispensing system, information on medication errors was collected in the following manner: (1) all drugs returned for credit were carefully examined for mistakes in labeling and content; (2) the medications on each nursing station were carefully examined once each day; (3) both nursing service and the medical staff were requested to report immediately any errors discovered; (4) the investigators conducted spot checks of one-half hour periods twice each day, Monday through Friday. Weekends were not studied.

The following procedures were established for the unit-dose dispensing system:

1. When a physician wrote a medication order in the chart, a carbon copy of the order was simultaneously produced. After the chart had been flagged, the floor clerk removed the carbon copy and sent it to the pharmacy by pneumatic tube.

2. The order was received in the pharmacy by a "central secretary." She transcribed each drug order, order change, or discontinued order onto a "patient medication record" (Fig. 1) and then clipped the order sheet copy to this form and placed them aside to be checked for accuracy by the

pharmacist. After these had been checked and initialed by the pharmacist, the "central secretary" placed a signal tab on the top margin of the form to indicate the time of day the *next* dose was due.

3. One hour before medications were scheduled to be given, the "central secretary" pulled all "patient medication records" and wrote medicine cards for each dose due for every patient the next hour. She fastened these medicine cards to the "patient medication record" and placed them to be filled by the "pharmacy technician."

4. The "pharmacy technicians" then prepared the individually packaged medications and placed each dose in a properly identified plastic drawer of a special metal cabinet mounted on a wheeled cart. Each drawer was identified with the patient's name, hospital number, and location. A separate cabinet was used for each of the two wings of the patient floor. Appropriate "Pharmacy Notes for Nurses" (Fig. 2) were placed in each drawer with each dose.

5. The filled cabinet was then brought to the "checking pharmacist" who added those doses prepared by the "compounding pharmacist" to the proper drawers. He then checked each dose and medicine card against the "patient's medication record." If everything was in order he validated the medicine card by stamping the date, time of day, and his initials on it.

6. The cabinets (which also contained an assortment of disposable needles, syringes, cotton swabs, alcohol, pencil and note paper), were then delivered to the appropriate wing by the pharmacy messenger.

7. The nurse who assumed custody of the locked cabinet unlocked it with a key which she had in her possession and which would unlock only the cabinet for that wing. She then wheeled the cabinet to the door of the patient's room and gave her medications as usual. With each dose of medication the nurse was supplied with (a) a single dose of the correct medication (except in the use of multiple-dose vials), (b) a medicine card in the traditional format, but with dilutions pre-calculated and any special remarks included, and (c) "Pharmacy Notes for Nurses" a card-size resumé of drug information pertinent to administration and observation of effects of the drug.

8. After administration of her medications the nurse pocketed the "Pharmacy Notes" and the medicine cards, removed the p.r.n. medication from the cabinet, placing it in the patient's cubicle at the nursing station, and placed the drug cabinet in position for returning to the pharmacy.

9. The nurse kept the "Pharmacy Notes" with her to use for reference in case the patient showed unusual symptoms or reactions. She used the medicine cards for charting her medications and then destroyed them.

10. In the pharmacy, the "pharmacy technicians" then cleared the returned cabinets, placing returned and unused medications and extra "Pharmacy Notes" in a special section where they remained for the subsequent dose of the same medication to be given. Special notes placed in the drawers by the nurses were given to the pharmacist, such as those requesting duplicate doses being sent for a patient who habitually loses the first one.

11. For the 5:00 P. M. doses, the "central secretary" prepared a *yellow* medicine card instead of a white one to indicate that this card must be re-used for each subsequent dose during the night (rather than being destroyed after each dose). The drawers in the cabinets were filled with enough doses to last each patient until morning.

12. At the end of each day the secretary pulled the copies of each "patient medication record," priced the doses listed thereon and sent the charge to the business office. (During this study this form was not used as a charge document because of the expense and confusion involved in the use of a form different from the regular charge forms originated by the pharmacy department.)

Special provisions were made to take care of the following exceptional situations: (1) Stat Orders. These, and orders requiring compounding, were filled by a pharmacist separate from the rest of the unit-dose dispensing system. They were dispatched immediately by pneumatic tube. After the "central secretary" had notified the special compounding section, and this pharmacist had copied the physician's stat order onto a *pink* medicine card, the "central secretary" then transcribed any continuing orders (following the stat dose) onto the "patient medication record" as usual. (2) P.r.n. Orders. The nurses were instructed that in the case of p.r.n. orders they were to transfer the medication and drug information card from the cabinet to the patient's pre-designated medication cubicle at the nursing station. (3) Floor Stock. During the study only narcotics, sedatives and p.r.n. analgesics were kept as floor stock. Emergency drugs were available on the nursing floor however. (4) Night Orders. Orders written after 5:00 P. M. were filled by the night or on-call pharmacist with enough medication to last until morning. A "starter dose dispenser" was introduced half-way through the study. This contained just enough of any one item to last until morning. (5) Emergency Night Orders. These were covered by the stock of emergency drugs present on the floor, and in exceptional instances, by the on-call pharmacist. (6) Narcotics and Barbiturates. These were handled in the same manner as under the previous system, *i.e.* kept as floor stock and furnished at no charge to the patient. In the case of these medications, the floor clerks prepared the medicine cards which were then checked by the nurse.

The Time Study. The time study was divided into two parts, these being (1) a control study to determine the time spent preparing medications prior to centralized unit-dose dispensing, and (2) the period of operation under centralized unit-dose dispensing. The sample was the 35 bed pediatric floor which had an average census of 18.5. During the control period the day shifts were studied on four occasions, there being three nurses involved in the preparation of medications during this period. The evening and the early morning shifts were studied to some extent to ascertain whether the picture would be different for these periods, but not enough data were collected to compute average times. It was noted that there were not as many interruptions during these periods, the preparation of medications thus being easier for the nurse.

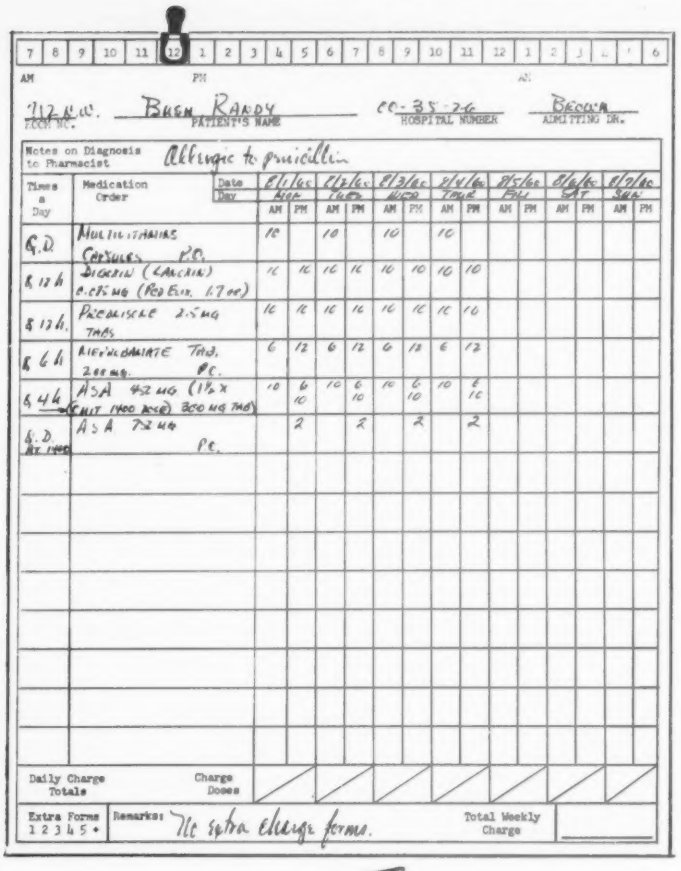
Times were measured by the use of a stopwatch calibrated to 1/100 of a minute. The stopwatch was started when a nurse at the nursing station placed her hands on any of the cabinets or counters containing medications and began to prepare medications or check cards. Times for interruptions were recorded but deducted from the times for preparation of medication. The stopwatch was stopped when the nurse left the area.

Certain time intervals were deleted from the data, as, for instance, when the nurse entered the area to put hand lotion on her hands or did nothing but wash her hands. If, however, she washed her hands as a result of preparing medications, such times were left in the study. Allowances (personal, etc.) were not taken into consideration because the study was done for comparison purposes and not to set standards.

Time taken to check the medicine cards with the Kardex, to take cards out of the card rack or replace them, to calculate correct measurement of doses, and to enter items taken from the locked narcotic cabinet were included in the times designated for preparation of medications.

The Questionnaires. Three questionnaires were prepared and administered. The first was given one month in advance of the study. Its purpose was to assess possible reactions by the nurses to such a study and to obtain their opinions of its relative usefulness. This questionnaire was exploratory in nature, consisting of open-end questions designed to obtain insight into the possible reactions which might be anticipated. The second questionnaire was more detailed and attempted to gain information about nurses' attitudes concerning certain factors involved in the administration of medications. This questionnaire was also used to obtain a general description of the nurses in the sample, and was administered just prior to the beginning of the study period.

The Patient Medication Record showing time when the next dose is due



7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6
AM PM AM

7127 N.W. — BUEN, RANDY — CC-35-76 — BECOA
ROOM NO. — PATIENT'S NAME — HOSPITAL NUMBER — ADMITTING DR.

Notes on Diagnosis to Pharmacist: Allergic to penicillin

Times a Day	Medication Order	Date / Day	11/16/66 MON		11/17/66 TUES		11/18/66 WED		11/19/66 THUR		11/20/66 FRI		11/21/66 SAT		11/22/66 SUN	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
q.d.	MULTIVITAMINS CAPSULES P.O.		10		10		10		10							
q.12h	DIGERIN (LANOXIN) 0.05 MG (RED ELIX. 1.7 cc)		10	10	10	10	10	10	10	10						
q.12h.	PREDNISOLE 2.5 MG TABS.		10	10	10	10	10	10	10	10						
q.6h	AMINOBENZOATE TAB. 200 MG. P.O.		6	12	6	12	6	12	6	12						
q.4h → (Omit 1400 dose)	ASA 32 MG (1/2 x 650 MG TAB)		10	6 10	10	6 10	10	6 10	10	6 10						
q.d. at 1400	ASA 324 MG P.O.			2		2		2		2						

Daily Charge Totals — Charge Doses

Extra Forms 1 2 3 4 5 + — Remarks: No extra charge forms. — Total Weekly Charge

PHARMACY NOTES FOR NURSES

These cards are to provide you with a quick, last-minute glance at the information about a drug that is of particular importance to the nurse administering the drug.

This information is by no means complete. For further information, see the hospital formulary or call the pharmacy

The information on the reverse side does not authorize you to do anything not generally considered to be within the authority of the nursing profession.

For example, antidotes are listed for some of the drugs. This is to let you know in advance which drugs you may be asked to locate in a hurry. It does NOT mean that you may administer the antidote without written authorization from the patient's physician.

Approximate Equivalents

1 Gm..... 15 gr
1 gr..... 60 mg
1 mcg..... 0.001 mg
1 mg..... 1,000 m
1 Gm..... 1,000 m

1 oz.....8 dram
1 ml.....16 min

1/320 gr..... 0.2 mg
1/200 gr..... 0.3 mg
0.4 mg

PENTOBARBITAL SODIUM U.S.P.

Syn - Nembutal, Isobarb, Napental, Pembule, Pental.
Use - Short-acting barbiturate.
Prep & Adm - Orally in elixir and caps. Rectal - Suppositories.
I.M. - Inject deep into large muscle (pref. gluteus maximus) in area where is little risk of hitting nerve trunk. Not more than 5 ml. in one site.
I.V. - Inject with caution at rate of 50 mg./min. May be diluted with Water for Inj. as desired.
Dose - Adult:
Oral - Up to 500 mg.
IM & IV - Up to 500 mg.
Pediatric:
Proportionately less.
Side Effects - Skin eruptions, vertigo, lassitude, headache, nausea, and diarrhea. Overdose causes resp. depression, feeble heartbeat, continued stupor, and may cause death.
Antidote - Pentylenetetrazol, bemegride, or amphetamine (all I.V.).
Onset of Action - 15 to 30 minutes.
Compatibility - May be mixed with scopolamine, but not with most narcotics (Ex. morphine, meperidine).
Stability - Supp. should be refrig.

Pharmacy Notes provides nurses with information about drug they are administering

The last questionnaire was a "follow-up" type designed to assess the nurses' expressed opinions concerning the study and the routine reference cards in particular, and for comparison with the second questionnaire as a reliability check.

All questionnaires were anonymous, though the investigators were able to code them in such a way that the results could be identified with each nurse in the study. Each set of questionnaires was given to the respondents simultaneously with no time restrictions.

Discussion of Results

Time Study

The results of the time study showed that during the control period, 93 medications were prepared for administration by nurses in a total time of 113.0 minutes, averaging 1.2 minutes of nursing time per medication prepared. During the time the experimental system was in operation 13 observation periods were conducted involving a total of 50 hours of observation. This sample represented approximately 9.6 percent of the total number of hours the experimental system was studied. Since the study was conducted on the pediatric floor the number of medications administered was much smaller than that normally administered on the surgical or medical floors where a greater percentage of nursing time is spent in the preparation of medications for administration. It seems highly possible that a significantly greater percentage of total nursing time might have been saved had the experiment been conducted on one of the latter floors.

In the results it is important to note several significant facts which greatly affect anticipated savings in nursing time through the use of centralized unit-dose dispensing. First, the figures on time consumed in the preparation of medications do *not* include time representing interruptions. Yet these interrruptions did *not* occur when the medications were prepared in the pharmacy. The actual time consumed by the interruption process itself (not counting the time consumed in tending to the matter for which the nurse was interrupted) was too difficult to evaluate, but from their number it seems reasonable to assume that their relative absence in the experimental system should result in additional savings in nursing time, not to mention the implications of the safety factor involved (one nurse observed during the control period was interrupted 19 times during the 43.55 minutes in which she prepared medications!).

A second factor to take into consideration is the time spent by the nurse in checking against the Kardex (nurses notes) the doses delivered to her under the experimental system. This time was recorded separately during the study because the purpose of this operation was to check on the accuracy of the system. It is anticipated that if the experimental system were to be adopted for general practice this checking operation would be maintained for the length of time it might take to assure the nurses of the dependability of the system and to give them a chance to adjust to this

rather significant re-assignment of traditional responsibility. The nurses' attitudes towards the experimental system are discussed later; however, it seems pertinent to point out here that most of the nurses were uneasy about having to abandon this responsibility even after the experimental system had been in operation for the duration of the study.

Questionnaires

The first questionnaire was given one month before the study to four nurses then employed on the pediatric service who later participated in the study. The answers to this questionnaire provided more information than was anticipated and seemed to indicate that the nurses would have a variety of attitudes towards the problem being studied.

One nurse reported working under a similar system unknown to the investigators. (This provided an opportunity to obtain some valuable information.) The fact that two of the nurses expressed a wish to spend more time at the bedside was more encouraging than the nurse who reported she wouldn't know what to do with any extra time.

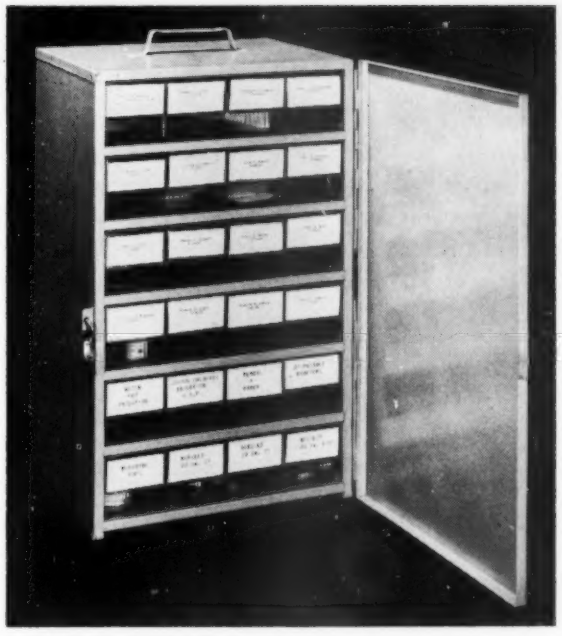
The second questionnaire was the most extensive, its prime purpose being to explore the nurses' spoken attitudes towards those questions thought pertinent to the study, and to drug distribution and administration in general. Three questions were about facts already known to the investigators and were included to serve as an indication of the general reliability of the respondent's answers to other questions relying upon recall.

One group of questions was intended to disclose facts on each nurse's individual background concerning drugs, while the rest of the questionnaire was devoted to questions intended to disclose the nurses' general attitude towards specific areas of drug preparation and administration. In this second questionnaire all answers to each of the questions were clear and understandable.

Of the nurses interviewed, most had attended a nursing school where "quite a bit" of emphasis was placed on the study of drugs, mostly in courses specifically designed for this purpose. Only two nurses stated they would have liked to have studied drugs in greater detail, yet 4 out of 8 felt that they didn't get enough information on pharmacology. Every single respondent felt that her exposure to drug administration as a student properly prepared her for nursing.

Though the Director of Pharmaceutical Services participates routinely in the orientation program for all new nursing personnel, only 2 of the respondents recalled this (or identified it as such). Other questions of fact were equally as confusing in the answers they elicited. This was interpreted as indicating that those questions relying upon recall possessed a moderate degree of unreliability for most of the respondents.

Medication Box showing plastic containers



The nurse unlocks the cabinet to get medications for patients

When asked to whom they go for drug information four nurses mentioned the physician, one: another nurse, and three: the pharmacist; yet 7 out of 8 respondents specifically felt that the pharmacist was responsible for supplying information about drugs. The nurses were unanimous in stating that they felt drug preparation and administration as generally practiced is safe, both according to their own opinion and the standards taught in their particular school of nursing.

Four questions were included to encourage criticisms useful in improving the design of the "Pharmacy Notes for Nurses" as described under research procedures.

The last questionnaire was administered after the study was completed in order to assess the participating nurses' reactions to unit-dose dispensing. Answering this questionnaire were six nurses who had participated in the study and all six answered the two qualifying questions correctly. The reaction to the study in general was very favorable. In follow-up interviews with the respondent nurses, many complained that the drug cabinet used was too bulky and clumsy to handle. In any future studies this could be easily remedied by having special cabinets constructed instead of using commercially available stock models as was done in this study. The question as to where an injection should be prepared received a variety of answers. Some nurses felt that the hallway was a better location than the nursing station because of the short period of time between preparation and administration and that there was less possibility of getting prepared syringes switched. Others chose the nursing station as being more free from interruption and from possibility of pathogenic contamination (sic). None of the nurses felt that she would *favor* accepting an injection prepared by anyone else, even a pharmacist, though several nurses mentioned that they had done this in the past.

Answers to questions concerning the "Pharmacy Notes for Nurses" confirmed the already recognized general acceptance and approval of these references. (Many inquiries were received from nurses not participating in the research for complete sets of these cards.)

In summarizing this discussion of the questionnaire results, it is important to emphasize that the primary purpose of all three questionnaires was to uncover certain information about those nurses participating in the study. Whether or not the same questionnaires could be used to evaluate the opinions of nurses who had not participated in centralized unit-dose dispensing was not a consideration in the preparation of the questionnaires. Since the sample size of the study provided such a limited number of actively participating nursing respondents, conclusions concerning the reactions of nurses *in general* should not be made.

Pharmacy Work Distribution and Personnel Qualifications

It was found that a clerk could be trained for the "central secretary" position satisfactorily in the 6 week period allowed. This training began with drug name familiarization, first through the routine posting of pharmacy requisitions, and then, the compiling of a cross-indexed pricing file. The next assignment was as clerk to the inpatient dispensing operation. Here she priced prescriptions, originated credit memos, typed labels, answered the phone, procured medications from the stock cabinets for the pharmacists, and, using appropriate references, answered simple questions regarding drug nomenclature, dose sizes available, etc. Next was a special training assignment during which she was given a stack of old copy sheets (carbon copies of chart order sheets from which drug orders had been taken) and required to write out her interpretations of the orders, if any, appearing on each sheet. Her transcriptions were then corrected by a pharmacist and errors were pointed out. It seems significant that during the entire length of the study, not one error of interpretation was ascribed to the clerk. This was true in spite of the fact that the system placed no reliance upon her interpretations, since it was a requirement that each transcription had to be checked by the "Checking pharmacist." The "central secretary's" final week of training was spent assisting the clerks on the nursing floors, observing the preparation, use and charting of medicine cards, and becoming familiar with the floor personnel with whom she would later be required to work.

The performance of the "central secretary" during the study was entirely satisfactory and no change in orientation and training was thought necessary in future studies.

The performance of the "pharmacy technician" was also satisfactory. Three errors were discovered by the "checking pharmacist" during the course of the study. These were no more than anticipated, however, since the "pharmacy technician" was a junior student at the College of Pharmacy with only nine months of previous dispensing experience gained only on weekends.

The responsibilities of the "special" pharmacist in this study were assumed by the "checking pharmacist," since the limited scope of the pharmacy operation precluded hiring an additional pharmacist for such a short period of time. Though this position seemed to enhance the speed with which emergency orders were filled and delivered, no really significant observations applicable to a full-scale unit-dose dispensing operation were obtained.

The experience of the "checking pharmacist" offered some interesting insights into such a role, the most important being the necessity for careful planning of the checking operation. Checking seemed to be

most easily and accurately accomplished when a list, compiled of all features of each dose that might require checking, was used. The best method of checking seemed to be *first* to note what was ordered, next, to visualize the filled order, and then, to check the dose dispensed. It was the opinion of the "checking pharmacist" that the checking process was very accurate at the beginning of the study, but that relative accuracy gradually declined until the time of discovery of an error. At this point accuracy returned to a high level where it again began a gradual decrease as doses were repeatedly filled correctly. It should be noted that the accuracy mentioned above was a subjective impression, and that as far as is known no medication errors passed out of the pharmacy uncorrected.

An interesting speculation, assuming the "checking pharmacist's" impressions were valid, would be to consider having an incorrectly filled dose purposely sent through the system periodically to serve as a stimulus to the "checking pharmacist." If the dose were prepared for a ficticious patient, the use of harmless placebo facsimiles of the "incorrect" drug would limit the consequences of the most serious error (should it leave the pharmacy) to the dispensing of a placebo for an active drug. If the "incorrect" *drug* were chosen so as to minimize the seriousness of administration of a placebo for a prescribed drug, (e. g. a multivitamin capsule), such an act might be justified in the interests of the increased accuracy which it should stimulate. Needless to say, the subjective impressions of this one observer require additional supplementation before reliable significance can be given them.

Preparation of Prepackaged Doses

The preparation and maintenance of prepackaged unit doses was much simpler than had been anticipated since we were able to assign these tasks to volunteer workers who were closely supervised by pharmacists. Multiple-dose vials presented a problem in that it was necessary to store them in the pharmacy for each patient between doses. Though more and more hospitals are using single-dose injectable medications, this may not yet be an economically practical solution in hospitals having a large number of indigent patients.

Study of Medication Errors

During the control period three months prior to the study, 13 errors were made in the pharmacy. Of these, 8 were not detected before they left the pharmacy. During the study period, no medication errors were reported by the nurses, though they checked each dose received against the nursing Kardex. It should be noted that during the control period a pharmacist was doing the checking for errors and it is possible that he

The patient receives medication in form of single dose prepared in the pharmacy

detected several errors that nurses might have missed. However, it seems safe to conclude that fewer errors were committed in the pharmacy during the study (none, in fact) than during the control period and that, because of this, unit-dose dispensing may be considered a safer pharmacy operation than the system previously used. The evaluation of errors committed *after* the medication left the pharmacy was made only by attempting to review incident reports turned in before and during the study. However, no incident reports were turned in during either period despite the fact that a simultaneous research project on medication errors revealed eight errors made on the nursing floor over four eight-hour shifts during the control period of the unit-dose dispensing system study!

Accuracy of Dose-by-Dose Accounting

Since the pharmacist automatically checked the technician's recording of each dose, it was certain that every single dose of medication for which there was a charge was placed on the "patient medication record," a copy of which was then priced by the "central secretary." Thus, there were no losses arising from failure to charge for medications as sometimes happens under other drug distribution systems.

Losses from Floor Stock

During the study no floor stock, other than free narcotics and barbiturates, plus a few external drugs, were allowed. The same situation might not be possible for floors other than Pediatrics, but since losses due to pilferage and deterioration were less during than before the study, it seems reasonable to assume that significant savings could have been realized on other floors as well.

Returns for Credit

The problem of accounting for returns for credit was eliminated since no credit was given for single doses delivered but not used. In such instances the charge was justified by the cost of handling the order. The job of returning unused medication to stock was insignificant.

Communications

The most important single problem encountered during the study (and present to a lesser degree in the previous system) was the communications difficulty encountered between the physician and the pharmacy. The pharmacy, under unit-dose dispensing, was faced with this problem to an extent heretofore experienced only by the nurse. For example, it was frequently necessary to contact the prescriber for reasons such as the following: Orders written for a non-formulary drug, for a special narcotic, or for whiskey, all on the wrong form; orders written for non-existent dosage sizes for which the compounding cost was prohibitive; orders written for investigational drugs, or for questionably large or small doses; ambiguous orders; requests for immediate delivery of drugs requiring special compounding, with no prior notice of their intended use; and "stat" orders for drugs already in the emergency boxes, to name but a few. In the previous drug distribution system the more discerning and conscientious nurses questioned the physician *shortly after the order was written,* when he could still be located at the nursing floor. Others merely "interpreted" his orders as seemed necessary at the time. During the study the pharmacy frequently received such questionable orders after the physician had left the patient floor area. Since the pharmacist was unwilling to "interpret" the physician's questionable order, the problem of contacting the prescriber for clarification was a frequent one. It would seem logical to assume that a unit-dose dispensing system which provided for preparation of doses by the pharmacist at the floor would largely eliminate such communications problems by making it possible to question orders shortly after they were written while the prescriber was still present. A solution to this problem may be provided by new and better communications facilities, however, and these should be investigated.

Preparation of Medicine Cards

Whether the medicine cards should be prepared at the nursing station or in the pharmacy was another question which arose during the course of the investigation. During the first two-thirds of the study they were prepared in the pharmacy as originally planned. This allowed additional information regarding dosage strength of injectables, etc., to be placed directly on the card, and had the added advantage of providing for a complete check by a pharmacist. The possibility that incorrectly prepared medicine cards might constitute a serious source of medication error had previously been shown in a study of medication errors made just prior to this study.[12] However, the preparation of the medicine cards in the pharmacy was disturbing to the nurses because they said they could no longer quickly thumb through a set of medicine cards to estimate how much time to allot for administration of medications during the day. This objection was almost unanimous and during the last two weeks of the study the preparation of the medicine cards was returned to the floor to the apparent satisfaction of the nurses involved. It is the opinion of the investigators that the advantages of preparing the medicine cards in the pharmacy far outweigh those of the alternative procedure and that during a study of broader scope a satisfactory solution could be worked out.

Conclusions: Unit-Dose Dispensing

1. The centralized form of unit-dose dispensing merits further study because it appears that the saving in nursing time is significant. Such a system, if satisfactory in all other respects, would enable hospitals to hire readily available lay-help for the pharmacy to compensate for the difficulty in obtaining nurses.

2. Economies from reduced losses of floor stock drugs were demonstrated but should be confirmed and measured in studies of greater scope and duration. This should help to offset the initial investment in pharmacy alterations and equipment which may be mandatory for the initiation of the system.

3. The ability to charge the patient on the basis of doses administered was demonstrated and should be attractive to those who are public relations conscious with respect to this point.

4. Certain special physical facilities may be required as, for instance, a dumb waiter connecting the pharmacy with the nursing stations.

5. The employment of pharmacy students for the filling of orders for routine prepackaged items may provide both experience for the student and advantages in economy and safety for the hospital. The routing of nurses through the pharmacy for the same purpose may merit consideration as a feature of in-service education for nurses.

6. The important position of central secretary may be assumed by a nontechnical, clerical person, but a period of orientation and training prior to, and separate from, her participation in the system is necessary.

7. The consistent accuracy of the checking pharmacist is a prerequisite to the safe use of this system. Though this was achieved in our study, further studies should be made to confirm the practicality of this standard.

8. Nurses who have participated in centralized unit-dose dispensing for short periods are still uneasy about administering medications prepared by anyone else. This is true even though each medication has been checked by a pharmacist and no incorrectly filled medications have been received by the nurse.

9. Nurses who have been exposed to routine drug reference cards delivered with each dose of medication were unanimous in their acceptance and approval of them, though several minor alterations were recommended.

10. Centralized unit-dose dispensing is particularly subject to communication problems involving the physician and the pharmacist. The possibility of improvement in this area should be investigated.

11. More experience with unit-dose dispensing is necessary before it can be determined whether the preparation of medicine cards is a significant problem requiring modification of the methods used in this study.

Conclusion Regarding the Study of Drug Distribution Systems in General

1. The following must be developed before the comprehensive evaluation of any drug distribution system can be attempted: (a) A method for evaluating the number and type of medication errors occurring after a medication leaves the pharmacy, and (b) A study and elucidation of those factors which are necessary for, or will promote accuracy in, the checking operation.

2. A full-scale study of unit-dose dispensing may be costly if extensive physical alterations are required in the pharmacy. However, once a separate pharmacy operation is established it can, with proper planning, be simply and inexpensively adapted for other systems, indicating that a sequence of studies may significantly lower the average cost of individual studies of this nature.

3. The same implication as in No. 2 can be applied to personnel costs, though obviously, those systems requiring the greater proportion of professional as opposed to nonprofessional personnel will be the more costly even in a continuous sequence of studies.

4. A study of the effects of a drug distribution system on the nursing floor can be satisfactorily evaluated with a much smaller sample that would be required to study the pharmacy operation under a proposed system.

References

1. Heard, J. S.: Considerations in Inpatient Dispensing, *Am. J. Hosp. Pharm. 15*:388 (May) 1958.

2. Safron, M. A.: A Critical Incident Study of Medication Errors and Near Errors in a Hospital, *Hospitals 34*:32 (May 9) 1960; *34*:53 (May 16) 1960.

3. Corcoran, C. I.: An Analysis of Recorded Errors in the Administration of Medications, (Unpublished Master's Thesis, Boston U. School of Nursing, June 1954).

4. Chlebik, Sister Mary: Dispensing Direct to the Patient, *Am. Prof. Pharmacist 6*:105 (Feb.) 1940.

5. Flack, H.: How the Hospital Pharmacist Can Contact the Doctor, Nurse, and Patient, *Hosp. Management 64*:88 (Oct.) 1947.

6. Collins, W. R.: Speeding Up Dispensing Service, *Hosp. Management 77*:78 (Mar.) 1954.

7. Parnell, C. G. and Sutton, F. S.: A Central Distribution Center, *Hosp. Management 79*:54 (Apr.) 1955.

8. Zugich, J. J.: Two New Methods That Simplify Pharmacy Service to Patient Units, *Am. Prof. Pharmacist 22*:438 (May) 1956.

9. Teplitsky, B.: Hospital Pharmacy as Viewed by Nursing Service, *Hosp. Progress 40*:94 (June) 1959.

10. Johnson, Emmett R.: Rights and Liabilities of the Hospital Pharmacist, (presented at meeting of Florida Society Hospital Pharmacists, Dec. 3, 1959, Jacksonville, Florida; unpublished).

11. Brodie, D. E.: Quality Control in the Pharmaceutical Service of Hospitals, *Am. J. Hosp. Pharm. 17*:406 (July) 1960.

12. Barker, K. N.: A Study of the Problem of Detecting Medication Errors in a Hospital, (Unpublished Master's Thesis, University of Florida 1961).

a system of PACKAGING & DISPENSING DRUGS IN SINGLE DOSES

by NEAL SCHWARTAU AND MADELYNE STURDAVANT

► PHARMACISTS DISPENSE 587 PACKAGES OF DRUGS and nurses prepare and administer 3039 medications daily (Table 1, page 552) in caring for the average census of 376 patients in the Rochester Methodist Hospital in Rochester, Minnesota. This activity is carried out under a "multiple-dose system" in which the pharmacy manually prepackages and prelabels drugs in standard quantities sufficient for 6 to 30 doses or applications.

The present system was installed six years ago by Chief Pharmacist Neal Schwartau who now proposes a system that takes advantage of recent advances in packaging equipment and materials. In the proposed "single-dose system," single units of drugs are prepackaged and prelabeled by use of automatic equipment and single doses are dispensed as required for administration.

Objectives

Purpose of study was to provide the hospital's board and building committee with information on which to

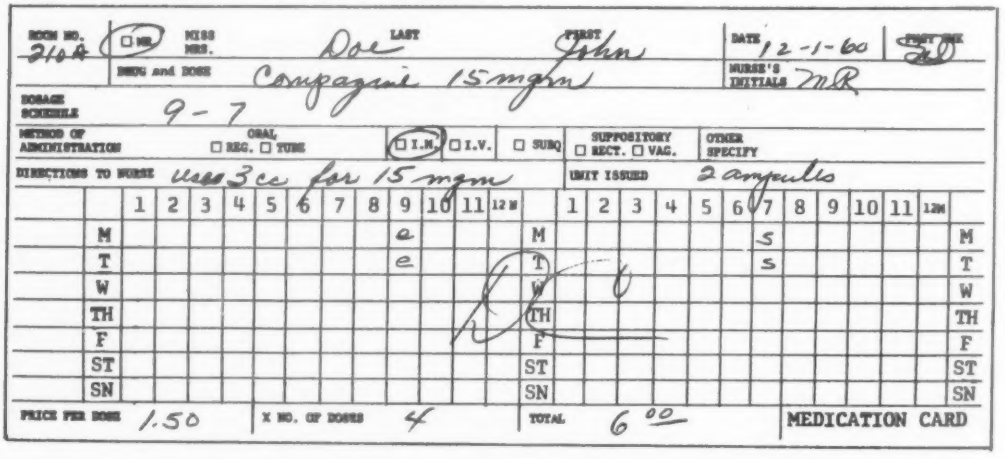

ROOM NO. 210A
MISS MRS. Doe LAST John FIRST
DATE 12-1-60
DRUG and DOSE Compazine 15 mgm
NURSE'S INITIALS MR
DOSAGE SCHEDULE 9-7
METHOD OF ADMINISTRATION ORAL REG. TUBE I.M. I.V. SUBQ SUPPOSITORY RECT. VAG. OTHER SPECIFY
DIRECTIONS TO NURSE Use 3 cc for 15 mgm
UNIT ISSUED 2 ampules
1 2 3 4 5 6 7 8 9 10 11 12 N 1 2 3 4 5 6 7 8 9 10 11 12 N
M T W TH F ST SN
PRICE PER DOSE 1.50
X NO. OF DOSES 4
TOTAL 6.00
MEDICATION CARD

FIGURE 1. MEDICATION CARD AND ORDER FORM, PROPOSED SYSTEM.—Size: 7½" x 3¼". In the proposed system, this card is sent to the pharmacy each time a medication is to be issued and is returned with the dose. When not in use, it is kept in a file box on the nursing unit. In the upper right-hand corner the pharmacist initials the card when it is received for the first time to indicate that the order has been checked and cleared for dispensing. On the lower section of the card a pharmacist places his initials in the appropriate space to indicate the day and hour an issued dose is to be administered. If a dose is returned, he crosses through the initials. The initials indicate who is responsible for the dispensed drug and the number of issues to be charged. They also indicate to a nurse which doses have been ordered and issued and this information helps her to avoid duplication in giving medications. Similar information is not available on the present medication card or nursing care card.

In the dosage schedule above, the numbers "9-7" in combination mean in this hospital that a medication is to be administered twice a day at 9:00 A.M. and at 7:00 P.M. The hour of administration is stated more explicitly when necessary to distinguish a time before or after noon, as may be noted on the drug record, Figure 5.

The large initials "DC" mean that the drug has been discontinued and the card has been sent to the pharmacy for charge purposes.

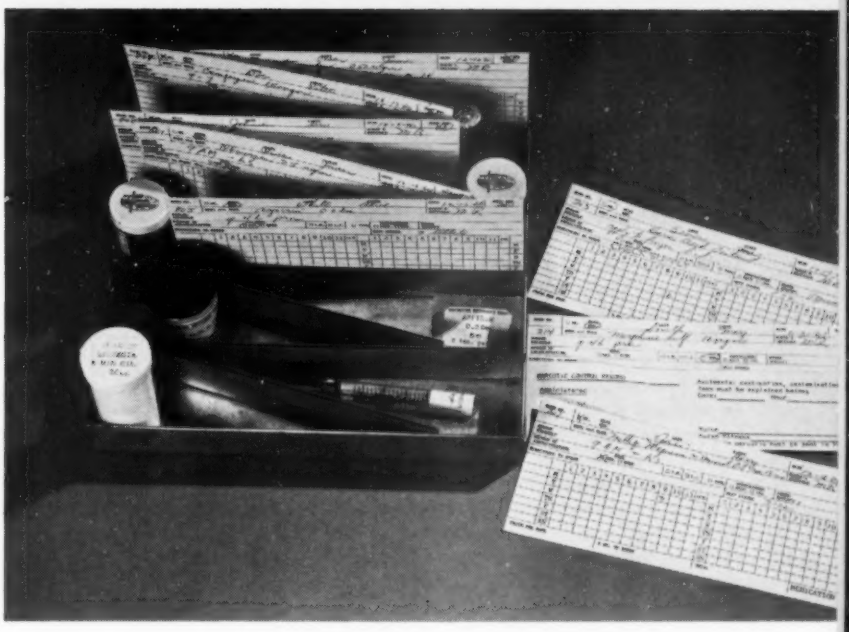


FIGURE 2. MEDICATION TRAY, PROPOSED SYSTEM.—Size: 9" x 8½". In the proposed system, medications that are to be given by the same nurse at the same scheduled time are delivered to a nursing unit in this medication tray. One compartment is used for each patient. A medication card fits snugly into a slot behind each compartment that contains an individual sealed and labeled dose. This tray has eight compartments but nurses recommend that the tray should have 12-15 compartments.

base their choice of a dispensing system for a proposed new building.

Objectives of the study were to evaluate effects of the two systems with respect to: workability, acceptance, time and salary cost, effect on patients' safety insofar as medications are concerned, clinical experience of student nurses and legal implications.

General Approach

The pharmacy, nursing service and business office perform the daily activities of the two systems. Principal activities that differ in the systems include:

Packaging and dispensing drugs that are administered to patients.

Checking drug orders and medications.

Preparing medications.

Ordering and maintaining drug supplies on nursing units.

Controlling narcotic supply.

Preparing and processing drug charges and credits.

NEAL SCHWARTAU is Chief Pharmacist and MADELYNE STURDAVANT is Research Director at the Rochester (Minn.) Methodist Hospital. They were assisted by MRS. R. G. BEARD, Nurse Coordinator, and EARL SCHWERMAN, Assistant Chief Pharmacist. General planning was under direction of a research committee composed of DR. DAVID T. CARR, Chairman, DR. F. RAYMOND KEATING, JR., ROBERT P. GAGE and EDWARD H. WELD of the Mayo Clinic; Hospital Administrator HAROLD MICKEY and Research Director MADELYNE STURDAVANT. The investigators were assisted on nursing procedures by a committee composed of a nursing instructor and supervisors and head nurses who represented the various clinical services of the hospital.

The project was financed by grants of $3,700 from the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS made available through research grants from Lederle Laboratories and $3,758 from Eli Lilly and Company.

The study included only the activities that differed between the systems. Methods of study are described later. The general approach was:

1. To conduct a pilot operation of the proposed system on one nursing unit and in the pharmacy so that both systems could be studied with respect to workability and acceptance and so that time per unit of activity could be determined.

2. To estimate time requirements for the total hospital by applying the time per unit of activity to total volume of activity, the total volume to be determined from available records or by supplemental surveys when necessary.

3. To evaluate, in counsel with appropriate authorities, features of the proposed system that may have legal implications or that pertain to clinical experience of student nurses and to incidence of medication errors.

Description of the Proposed System

The present system is quite similar to that used in most hospitals and therefore does not seem to require full description. Instead, the following description of the proposed system includes comparisons with the present system that cover the more significant differences between the two. Description also includes comments on experience with the proposed system during its pilot operation.

Procedures that remain the same in the two systems are not included in the description. These pertain to physicians' written orders, to administration and charting of medications by nurses, and to nurses' checking of physicians' orders, of medication cards, of drugs and of patient's identity. However, additional checking in the proposed system is described.

This section of the report is purely descriptive. Effects of features that differ in the proposed system are evaluated by pharmacists and nurses in the section that immediately follows the description.

Drug Issues. By use of automatic equipment, bulk quantities of tablets, capsules and liquids are measured into single doses, are packaged and labeled. Tablets and capsules are in sealed packets. Liquids are in covered, disposable drinking containers. Individual doses remain in the same labeled container until they are opened at the patient's bedside.

The process of mechanical prepackaging and labeling of individual doses replaces present manual methods in the pharmacy and eliminates virtually all manual measurement and preparation of individual doses on the nursing unit.

Drug Supplies. Drugs that are administered to patients remain in the pharmacy until they are to be administered, with two exceptions. One exception is about 15 single doses of selected drugs that are available on each nursing unit for emergency use. The other exception is drugs such as ointments, lotions and sprays that continue to be issued in quantities sufficient for several applications because the amount required per application cannot be stated precisely. Such drugs are used principally on the dermatological, eye and ear, nose and throat services. The infrequency of multiple-dose issues on other services is illustrated by experience while the proposed system operated on a medical and surgical nursing unit. Of 1820 orders received from this unit, 10 were for drugs that were issued in multiple doses.

In contrast to this limited supply on the nursing unit, the present supply dispensed by the pharmacy to each of the 17 nursing units consists of all drugs for individual patients and general supplies of drugs that are administered to any patient on order of his physician. The general supply includes narcotics and barbiturates that are in a locked cabinet and other drugs such as analgesics, laxatives and insulin. In addition, a nursing unit's supply may include drugs that are being investigated clinically before they have been released by the Federal Food and Drug Administration for general use.

Pharmacy Hours. To dispense individual doses whenever they are required for administration, it is imperative that the pharmacy operate continuously whereas at present, the pharmacy is open 11 hours on Monday through Saturday and 6 hours on Sunday. During remaining hours at present, a limited number of selected packaged drugs that are used regularly are issued from central supply service and packaged drugs that are needed infrequently may be obtained from the pharmacy by a night supervisor. In addition, pharmacists are on call as required.

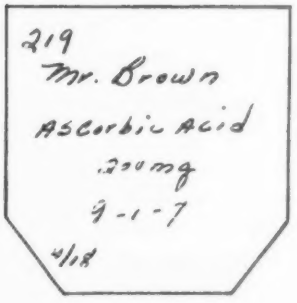


FIGURE 3. MEDICATION CARD, PRESENT SYSTEM.—Size: 2" x 2". In the present system, this card is used each time a medication is prepared and administered. When not in use, it is kept with the nursing care card in a Kardex. The numbers "9-1-7" above, in combination, mean in this hospital that a medication is to be administered three times a day, at 9:00 A.M., 1:00 P.M., and 7:00 P.M. The hour of administration is stated more explicitly when necessary to distinguish a time before or after noon.

Ordering and Dispensing. A nurse orders a drug by sending to the pharmacy a revised medication card that also functions as a "traveling requisition." (Figure 1) A pharmacist returns the medication card with the ordered drug. A nurse uses the card for checking the drug and identifying the patient to whom it is to be administered, then she files the card for use in reordering. The same form (Figure 1) is used for the occasional multiple-dose order.

About three-fourths of medications received by patients are administered on regularly scheduled hours. To prepare for a "medication hour" each nurse who is responsible for a group of patients selects the appropriate medication cards, places them in an envelope and sends them to the pharmacy. The pharmacy sends the ordered drugs to the nursing unit in a medication tray. In the tray, each patient's drug is in a separate compartment with the corresponding medication card in a slot beside the compartment (Figure 2). Items in the tray are arranged in numerical order by patients' room numbers.

These scheduled medications are delivered to the nursing unit a few minutes before they are to be administered, but they are ordered well in advance of that time. While the proposed system was in operation, pharmacists had an average of 59 minutes available to fill orders for these drugs. The elapsed time between receipt of orders and time for delivery ranged from 10 to 209 minutes.

The remaining fourth of medications received by patients are unscheduled—that is, physicians' written orders instruct the nurse to administer the drug when the patient needs it. Orders for these unscheduled medications are sent to the pharmacy one or two at a time intermittently throughout the day and night and such orders require immediate attention. While the proposed system was in operation the average elapsed time between receipt and delivery of such orders was five minutes. It took as long as 13 minutes to dispense a few drugs that required special compounding, while it took one minute to dispense a few orders that were designated "rush" by placing a signal tab on the medication card.

The medication card that serves as a traveling requisition replaces the present medication card (Figure 3) and the present form that is used to order multiple-dose issues (Figure 4).

Checking. A pharmacist checks each new order for possible incompatibilities or incongruities by reviewing information on the medication card and by referring to a patient's "drug record" (Figure 5). The drug record states the patient's age, weight, allergies, diagnosis or surgical procedure and identification data. This information is written by a nurse who sends the record to the pharmacy shortly after a patient is admitted. Each time an order is first received in the pharmacy, information about the drug also is entered on the drug record from the medication card so that checking of new orders can include a review of other drugs the patient is receiving. After checking each new order a pharmacist clears the order for dispensing by initialing the medication card in the upper right-hand corner (Figure 1).

The only order that was not cleared as received while the proposed system was in operation on one nursing unit was for a drug in a chocolate base for a patient who was allergic to chocolate.

During dispensing there is additional checking. A pharmacist checks the label of each item with the corresponding medication card and initials the lower section of the card to indicate who is responsible for the issue. He places the initials in the appropriate space to indicate the day and hour the drug is to be administered (Figure 1). The initials serve as a record of issues for charging purposes.

As a sequel to the present study, the Chief Pharmacist is recommending study of systems to transmit copies of physicians' orders to the pharmacy to provide an additional

DRUGS

DATE 12-1 19 60

NAME Mr Jones ROOM NO. 235

PLEASE CIRCLE METHOD OF ADMINISTRATION

(Oral) IM IV Supp	Tetracycline 250 mgm		
Oral IM IV Supp			
Oral IM IV Supp			
Oral IM IV Supp			

(DO NOT WRITE IN ABOVE SPACE)

ORDERING DOCTOR _____ SIGNED BY M Roe

FORM 8

FIGURE 4. ORDER FORM, PRESENT SYSTEM.—Size: 7¼" x 2⅞". In the present system, a nurse writes the order, a pharmacist dispenses a multiple-dose package and a clerk writes a charge on this form which functions as a charge voucher for reporting to the cashier. The form requests some information of the nurse about the method of administration, but not complete information, as may be seen by comparison with the revised medication card and order form, Figure 1; and it requests no information about the timing or strength of a dose. In the illustration above, the doctor ordered 500 mgm. per dose and the nurse ordered the drug in 250 mgm. per unit because she knew it was stocked in that strength. At other times a nurse may state the unit per dose, but the pharmacist does not know what quantity is being stated; or a nurse may state no quantity.

ROOM NO. 210A (MR.) ☐ MISS ☐ MRS. LAST Doe FIRST John AGE 37 WEIGHT 138 ADMITTING DATE 11-28-60 PATIENT'S DRUG RECORD

ALLERGIES Penicillin DIAGNOSIS OR TYPE OF SURGERY Gastric Resection SERVICE Smith

DRUG AND DOSE	DOSAGE SCHEDULE	METHOD OF ADMINISTRATION	START DATE	DC DATE	CHARGES FOR WEEK ENDING 12-4	12-11		
Meperidine 50 mgm Atropine gr 1/150	Pre op on call	☐ORAL ☐I.V. (IM) ☐SubQ	11/29	—	.90	-		
Meperidine 50 mgm	q 3-4h prn	☐ORAL ☐I.V. (IM) ☐SubQ	11/30	12/2	5.60	-		
I.V Fluids		☐ORAL (I.V.) ☐IM ☐SubQ	11/30	12/1	21.00			
Nembutal 50 mgm	hs prn	(ORAL) ☐I.V. ☐IM ☐SubQ	11/30			.70 .40		
Compazine 15 mgm	q 6-7	☐ORAL ☐I.V. (IM) ☐SubQ	12/1	12/3	6.00			
Empirin Compound #4	q 3-4h prn	(ORAL) ☐I.V. ☐IM ☐SubQ	12/2	12/4	1.00			
Hexavitamins	q AM	(ORAL) ☐I.V. ☐IM ☐SubQ	12/3			.35 .05		
Darvon Compound	q 4h prn	(ORAL) ☐I.V. ☐IM ☐SubQ	12/4			.75		
		☐ORAL ☐I.V. ☐IM ☐SubQ						

I.V. FLUID CHARGES AND SOME ADDITIVES OBTAINED FROM ATTACHED CARD. OTHER CHARGES FROM DRUGS LISTED ABOVE.

WEEKLY TOTAL 34.50 2.35

FIGURE 5. DRUG RECORD, PROPOSED SYSTEM.—Size: 8" x 5". A nurse fills in the heading of this record and sends it to the pharmacy shortly after a patient is admitted. In the pharmacy each drug that is ordered is described on one line of the lower section. A pharmacist checks each new order with the information on the drug record to detect possible incompatibilities or incongruities. He then initials the medication card (which is also the order form, Figure 1) to indicate that the order has been cleared for dispensing. Charges are transferred to this drug record from medication cards and one total charge is reported for each billing period. The drug record accompanies the final charge to the business office for reference in supplying detailed information about drug charges to patients or to third-party payors.

When a drug is discontinued the charge is entered on the lower of the two spaces for each drug. A date is not entered in the column "discontinued date" for drugs that continue to be administered until the patient is dismissed.

source of checking. With this exception, the proposed system provides pharmacists with quite complete information by which to check orders whereas, at present, the only information routinely available to them is the minimal amount on the present order form (Figure 4).

Nurses also have additional opportunity for checking. The record of issues on the medication card (mentioned two paragraphs above) enables a nurse to determine whether a dose has been received for administration, whereas neither the present medication card nor nursing care card indicates that a dose has been prepared and administered. In addition, the label on each single dose gives a nurse final opportunity to check drug and medication card at the patient's bedside whereas at present the individual dose is in an open, unlabeled container. (But in either system, the drug is accompanied by the medication card.)

Combining of Drugs. Pharmacists add drugs to intravenous base solutions and combine drugs for other injections. Particular combinations of drugs are ordered frequently and most of the combinations remain stable long enough to permit the combining to be done collectively in advance.

Most of the combined drugs for injections are administered preöperatively and orders for such injections are written by physicians the evening before patients' surgery. Such orders are sent to the pharmacy in the evening, the drugs are prepared during the night and a drug with medication card is delivered the following day when requested by telephone. While the proposed system operated, one of the head nurses reported that she had ordered, received, administered and charted two such injections within three minutes.

The combining of drugs in the pharmacy enables the pharmacist to label the mixture that will be administered instead of (at present) labeling the different drugs that are combined by nurses from drug supplies on the nursing unit.

Special I.V. Card. Without a special card for ordering intravenous fluids it would be necessary for a nurse to write a medication card each time a different solution or additive is ordered by a physician. The special card (Figure 6) is for ordering a base solution and any drug that is to be combined with it before dispensing. Eleven bottles of solution with or without additives can be ordered on the front and reverse sides of the card. To avoid interruption during administration of bottles of solution, two bottles are ordered the first time; when the second and each successive bottle is put into use, the next bottle is ordered to be available when required.

Narcotic Control. Extra procedures are required in dispensing and administering narcotics to maintain control of the supply and to record usage in compliance with legal requirements.

To order a narcotic, the nurse who is to administer it signs the back of the medication card. (Such signature is not required for other drugs.) In the pharmacy a photocopy is made of the upper section of the card's face after covering the lower section with a printed form that provides space for reporting administration or loss of the issued dose (Figure 7). The photocopy accompanies the narcotic that is issued and the medication card is held in the pharmacy. After administering the drug, the nurse writes the date, hour and her name on the photocopy and sends it to the pharmacy. A pharmacist then releases the medication card to the nursing unit.

The nurse who signs the narcotic order is responsible for returning the signed photocopy or reporting failure to receive it. If a photocopy is not returned within a reasonable length of time a pharmacist calls the nurse who signed the order. The supply of narcotics outside the pharmacy consists of the several doses that are in process of being administered.

A file of the photocopies and a perpetual inventory of narcotics are the only records necessary to satisfy legal requirements.

In contrast, present procedures require that a nurse write eight items of information on a "sign-out card" to identify the patient, the physician, the dosage, the nurse, and time of administration. The charge nurse must keep the key to the narcotic cabinet with her and trips may be necessary by another nurse to locate the charge nurse to obtain or return the key. In addition, the supply of narcotics is inventoried by two nurses three times a day before nursing shifts change.

Present procedures in the pharmacy include checking the completed sign-out card that accompanies each order for a replacement, stamping containers and records with identifying serial numbers, posting charges and credits of narcotics and sign-out cards to each nursing unit and personal delivery of narcotics to obtain the receiving nurse's signature.

ROOM NO. 2104 ☑ MR. ☐ MISS ☐ MRS. LAST Doe FIRST John DATE 12-30-60 **I.V. FLUID ORDER CARD**

	DATE	BASE SOLUTION	CHG.	ADDITIVES TO BE ADDED BEFORE DISPENSING	CHG.	PHCY CHK.
1	11/30	☐ DEX5% W1000 ☐ DEX5% S.2% OTHER: SPECIFY ☐ DEX5% W 500 ☐ NORM.SALINE 1000 ☐ DEX5% S1000 ☐ NORM.SALINE 250 ☐ DEX5% S 250 ☐ TRVT.ELECT.#1-1000	450	☐ VITBcmplx-E OTHER: SPECIFY ☐ KCl 20 meq. ☐ KCl 40 meq.	150	
2	11/30	☐ DEX5% W1000 ☐ DEX5% S.2% OTHER: SPECIFY ☐ DEX5% W 500 ☐ NORM.SALINE 1000 ☐ DEX5% S1000 ☐ NORM.SALINE 250 ☐ DEX5% S 250 ☐ TRVT.ELECT.#1-1000	450	☐ VITBcmplx-E C OTHER: SPECIFY ☐ KCl 20 meq. ☐ KCl 40 meq.		
3	12/1	☐ DEX5% W1000 ☐ DEX5% S.2% OTHER: SPECIFY ☐ DEX5% W 500 ☐ NORM.SALINE 1000 ☐ DEX5% S1000 ☐ NORM.SALINE 250 ☐ DEX5% S 250 ☐ TRVT.ELECT.#1-1000	450	☐ VITBcmplx-E C OTHER: SPECIFY ☐ KCl 20 meq. ☐ KCl 40 meq.		
4	12/1	☐ DEX5% W1000 ☐ DEX5% S.2% OTHER: SPECIFY ☐ DEX5% W 500 ☐ NORM.SALINE 1000 ☐ DEX5% S1000 ☐ NORM.SALINE 250 ☐ DEX5% S 250 ☐ TRVT.ELECT.#1-1000	450	☐ VITBcmplx-E C OTHER: SPECIFY ☐ KCl 20 meq. ☐ KCl 40 meq.	150	
5		☐ DEX5% W1000 ☐ DEX5% S.2% OTHER: SPECIFY ☐ DEX5% W 500 ☐ NORM.SALINE 1000 ☐ DEX5% S1000 ☐ NORM.SALINE 250 ☐ DEX5% S 250 ☐ TRVT.ELECT.#1-1000		☐ VITBcmplx-E C OTHER: SPECIFY ☐ KCl 20 meq. ☐ KCl 40 meq.		

Continue of Reverse Side of Card

FIGURE 6. INTRAVENOUS FLUID ORDER CARD, PROPOSED SYSTEM.—Size 7½" x 3¼". On the front and back of this card, eleven bottles of intravenous base solution, with or without additives, can be ordered in the proposed system. Without this special card a nurse would have to write a new medication card each time a different combination of base solution and additive was required. Additives are ordered on this card only when they are to be combined with the solution in the pharmacy. However, drugs are added to about 1 per cent of base solutions after the solution is flowing. In such case, the drug to be added is ordered on a regular medication card (Figure 1) so the pharmacist will not add the drug before he issues the base solution.

The large initials "DC' mean that the solution has been discontinued and the card has been sent to the pharmacy for charge purposes.

At present, a shortage in the narcotic supply requires communication with each nurse on duty and may require communication with the previous shift of nurses if an inventory is overlooked as the shifts change. If no one recalls a dose she failed to record, the next step is to check patients' charts. If the search fails, a written report of loss is prepared. Occasionally a loss entails conferences at the management level and communications with outside authorities.

At present, barbiturates as well as narcotics are included in the extra control procedures. But because of tighter control on supply in the proposed system, barbiturates are removed from the extra procedures.

Charges. Patients receive statements of account weekly and on dismissal. The pharmacist reports a single total drug charge for each billing period. A charge for each drug is determined from the record of issues on the medication card (Figure 1) and the charge is entered on the patient's drug record (Figure 5).

For weekly billings, the reported drug charge includes only those drugs on which medication cards have become "inactive" during the billing period. Inactive cards include those on drugs that have been discontinued (a nurse writes "DC" boldly across the card and sends it to the pharmacy). Inactive cards also include those removed from circulation by the pharmacist after the cards have been in use seven days. A replacement is prepared for the nursing unit by covering the record of issues on a card's lower section and photocopying the heading on to an unused card.

We pause in the description to comment on a weakness of the system implied in the foregoing paragraph. Preparing weekly drug charges only from inactive medication cards results in disagreements between drugs that are charged and drugs that are administered within a billing period. This disagreement may be confusing to a patient who, for example, remains in the hospital 10 days. He pays for the first week, then finds on his final statement a drug charge that seems high in relation to the relatively few drugs he received after the first week.

This weakness could be overcome by posting of charges as drugs are issued, but hand-posting of many issues is impractical. Therefore, the investigators recommend that mechanical means of posting be explored when the entire accounting operations of the hospital are studied.

Returning to charging procedure, the final drug charge is prepared from all remaining medication cards. These are sent to the pharmacy by a nurse with a notice that the patient is to be dismissed. A pharmacy clerk can tell whether all cards are received by checking charge entries on the drug record.* If a card should be lost, the number of doses administered could be determined from the patient's chart. (If posting can be done mechanically, as suggested above, medication cards would not be required at the time charges are reported.)

In preparing only one drug charge for each patient's statement, 86 charges are reported daily by the pharmacy in contrast to 721 at present that are reported by three departments. Chargeable drugs that are administered from general supplies on nursing units are reported by ward clerks. Charges on drugs that are issued in the name of individual patients are reported by the pharmacy and by the central supply service that issues selected packaged drugs when pharmacy is closed. Charges from these departments are delivered to the cashier periodically by messengers. Some charges, however, trickle in after final statements are presented and paid. This is because several departments perform charging activities, the number of charge vouchers and time of delivery are variable and it is inevitable that some link in the required interdepartmental communication occasionally is overlooked.

The proposed system, however, significantly reduces or eliminates late charges through simplicity of procedure and fixing of responsibility. The pharmacy receives a list of

*There is a separate column for each week's charges and two positions in which a drug charge can be entered: one position is for the last charge on a discontinued drug; the other is for charges on drugs that still are being administered (Figure 5).

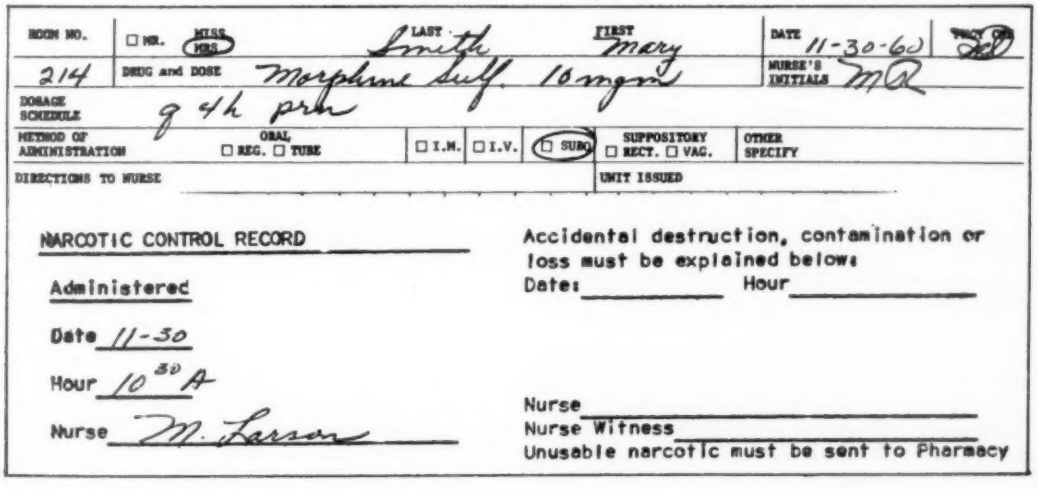
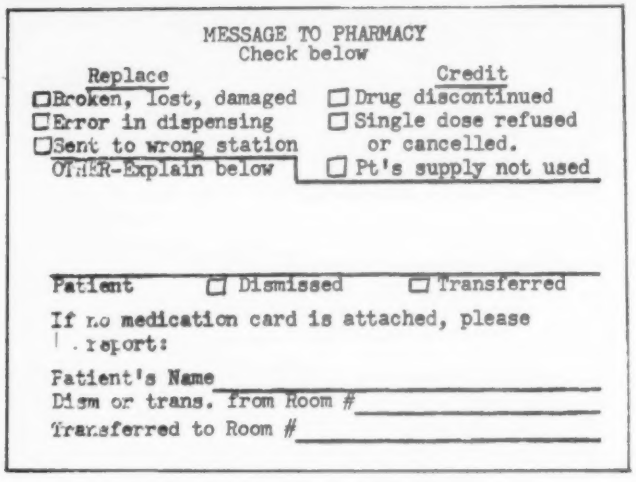


FIGURE 7. NARCOTIC CONTROL RECORD, PROPOSED SYSTEM.—Size: 7½" x 3¼". The upper part of this form is a photocopy from the medication card, Figure 1. The lower section is a form that is placed over the record of drug issues before photocopying. The photocopy is made in the pharmacy and it accompanies a dose of narcotic to the nursing unit. The pharmacist keeps the regular medication card until he receives the signed report that the narcotic has been administered. A file of these photocopies is all the record that is required of narcotic usage.


MESSAGE TO PHARMACY
Check below

Replace
☐ Broken, lost, damaged
☐ Error in dispensing
☐ Sent to wrong station
OTHER-Explain below

Credit
☐ Drug discontinued
☐ Single dose refused or cancelled.
☐ Pt's supply not used

Patient ☐ Dismissed ☐ Transferred

If no medication card is attached, please report:

Patient's Name _____
Dism or trans. from Room # _____
Transferred to Room # _____

FIGURE 8. MESSAGE TO PHARMACY SLIP, PROPOSED SYSTEM.—Size: 4½" x 3¼". In the proposed system, this slip accompanies a medication card to the pharmacy when any explanation is required. Its purpose is to save time in communication.

patients for whom statements are being prepared each day. The cashier knows that for each statement she prepares, the pharmacy is to send one drug voucher reporting charges or reporting no charge during the billing period. If a voucher is not received, checking requires one telephone call to the pharmacy.

The patient's drug record in the proposed system also simplifies other office activity. The drug record accompanies the patient's final drug charge to the cashier to be available for reference when a patient asks for detail about a charge and to be available for photocopying when a third-party payor asks for itemized drug charges. The drug record eliminates present pulling of drug vouchers from storage boxes where they are filed by date and room numbers and eliminates clerical work in preparing itemized lists of charges.

Credits. Some single doses are returned for credit because medications are discontinued after being ordered or because a patient is sleeping or refuses a medication. When a drug and corresponding medication card are returned, the unopened labeled item is returned to stock and the record of issue is scratched so that it will not be counted in charges. No credit voucher is required for single doses or for the few multiple-dose issues because credit is not given on drugs such as ointments and lotions.

Waste of drugs is reduced to the unused portions of the few drugs that are issued in multiple doses, whereas at present the unused portions of 44 drugs are returned from nursing units daily and many of the drugs cannot be returned to stock without danger of contamination or mixing of drugs.

Messages to pharmacy. A "message to pharmacy" slip simplifies communications from nurses to pharmacists. The slip contains comments about such matters as return of a drug or dismissal of a patient (Figure 8). A nurse checks the appropriate comment and attaches the slip to a medication card.

Delivery System. In a new hospital building there will be pneumatic tubes and automatic conveyors for deliveries between nursing units and pharmacy. Elevators are the only mechanical conveyors in the present building and both pharmacy and nursing personnel make trips to deliver or pick up drugs. Time spent in such activity was excluded from study of both systems because the time will not be required in a new building. While the proposed system operated, a messenger was stationed on the nursing unit to substitute for the rapid mechanical conveyance that is essential to the proposed system in a multi-story building.

Opinions on the Proposed System

Pharmacists' Evaluation. The pharmacy staff consists of four pharmacists and four clerks and technicians. They operated the pharmacy continuously to serve the pilot nursing unit while maintaining established hours of service to all other units under the present system. In preparation for the pilot operation, they set up an auxiliary dispensing center in the pharmacy and manually pre-packaged and labeled drugs in single units to keep packaging requirements to a minimum during the system's operation.

The proposed system operated for two weeks. During that time the pharmacy dispensed 2500 orders* to the pilot unit and each pharmacist had experience with the system during all hours of the day and night. The pilot operation was considered to be adequate for judging the workability of procedures, although it did not provide experience with a full-scale operation in properly adapted physical facilities. At the close of the pilot operation each pharmacist reported his evaluation of 21 points covering various aspects of this operation.

All procedures of the system worked smoothly. However, as mentioned in foregoing description, effectiveness of the charging procedure could be improved by mechanical posting of charges at the time drugs are dispensed.

Reported advantages of the proposed system were:

1. Increased safety in the handling of drugs as a result of the following features:
   a. Pharmacists issuing all drugs including intravenous fluids and combining drugs in the form in which they are to be administered.
   b. A drug remaining in the same labeled container from the time it is packaged or combined until it is administered.
   c. Pharmacists having sufficient information for thorough checking of orders.
   d. Nurses having opportunity for additional checking.
   e. Measuring of doses with precision equipment.
   f. Eliminating possible contamination of drugs that now are issued in multiple doses.
2. Increased operating efficiency in the following respects:
   a. Centralizing drug supplies, improving inventory control and eliminating the responsibility for checking of dispersed supplies.
   b. Pharmacists having opportunity to learn dosage practices, enabling them to purchase more effectively. Also, knowledge about dosages enables pharmacists to report dosage practices to manufacturers for their guidance in evaluating new drugs and in adjusting manufactured units to prevailing dosage practices.
   c. Pharmacists having custody of investigative drugs and opportunity to learn about their use, dosage, contraindications and methods of compounding and administration.
   d. Gaining a simple and effective means of controlling narcotics.
   e. Eliminating drug credits and establishing an effective system of drug charging that fixes responsibility in the pharmacy, provides a control record of drugs to be charged (patient's drug record) and simplifies the procedure for avoiding late charges.
3. Availability of medication cards and drug records for research and teaching purposes.

Reported disadvantages are:

1. Possible difficulty in recruiting candidates for pharmacists' positions in which rotation of night duty is required.
2. Possibly more questions from a patient about his statement of account when it includes a single drug charge instead of separate charges for each kind of drug.

In a general appraisal, the four pharmacists preferred the proposed system to the present one, or to others they have

*The 1810 single-dose orders and 10 multiple-dose orders mentioned elsewhere are for 10 days of the two weeks, during which record was kept of the time orders were received.

studied. They reported increased work satisfaction from thorough checking of drug orders and from other features of the system that added interest, challenge, and a sense of increased contribution to patients' welfare.

Nurses' Evaluation. Nine graduate professional nurses and four senior student nurses worked on the pilot nursing unit throughout the time both the present and proposed systems were under study. At the close of data collection on the unit, they compared the two systems in a 15-item questionnaire.

The efficiency of the proposed system was rated much greater by seven nurses, somewhat greater by five and about equal to the present system by one. An efficient system was defined in the questionnaire as one that is simple and easy to operate, that fits smoothly into related activities and does not involve delay or waste of time. The following advantages of the proposed system were mentioned with respect to efficiency:

1. Availability of pharmacist at night for advice and prompt service.
2. Elimination of:
   a. Storing, locating and checking drug supplies.
   b. Writing orders to the pharmacy for drugs. (The medication card is used.)
   c. Checking drug supplies for patients who are being dismissed and returning drugs to the pharmacy with credit vouchers.
   d. Locating and returning the narcotic key.
   e. Checking narcotic supplies three times a day.
   f. Checking to account for a shortage in the narcotic inventory and reporting of loss.
   g. Locating the night supervisor for a drug that is not available in central supply and waiting for her to bring it from the pharmacy.
   h. Interrupting the preparation of medications to reorder a drug that was not reördered when the last dose was given.
   i. Writing charge vouchers.
3. Great reduction in time now spent in:
   a. Preparing medications. (Nurses continue to fill some syringes from ampuls and to add drugs to intravenous base solution when, in one percent of all bottles of intravenous fluid, the drug is added during flow of the solution.)
   b. Telephoning a pharmacist for advice pertaining to preparation of medications.
   c. Reporting the administration of narcotics.

As a result of the time saved, each nurse commented on either a reduced work load or an easing of pressure during rush periods. A few reported less overtime work. Several nurses also commented on lessening of confusion at the nurses' station and medication counter.

The one reported disadvantage in efficiency of the proposed system pertains to unscheduled medications that are given as need arises. The disadvantage lies in the fact that drugs usually are on the unit now, whereas they must be ordered in the proposed system. A result is that a nurse in the present system can attend to an unscheduled medication need, complete the task and proceed to another. In the proposed system, however, there is a time lapse between ordering and receiving the medication, during which a nurse must go to another task with an unfinished one in mind. To help with this problem, the head nurse used a tap bell to notify a nurse that her ordered medication had arrived.

A similar problem does not occur with scheduled medications that are ordered in advance since nurses know the medications will arrive a few minutes before the scheduled time for administration.

Regarding promptness of service, all respondents commented on very prompt service on scheduled medications, on orders marked "rush" and on preoperative hypodermics that were ordered and prepared at night, ready for delivery when requested the following day. Three nurses, however, thought medications for pain could be administered more promptly when drugs were stored on the nursing unit than when they must be ordered. Since a signal tab can be attached to the medication card to indicate "rush," other nurses did not experience a deficiency in promptness on medications for pain.

Regarding medication errors, 10 nurses believe there would be increased opportunity to avoid errors or near-errors because a pharmacist as well as a nurse would be checking the order and the individual dose. Three nurses reported no difference between systems with respect to opportunity for error. Comments about pharmacists' competence suggested that some nurses might tend to rely on 100 percent accuracy of pharmacists. For this reason, there would be need in the proposed system for continued emphasis on all checking procedures.

The head nurse expects additional checking to result from the labeled individual dose. She felt the patient's interest* and prominence of the drug label would stimulate a final check of the drug with medication card at the patient's bedside, whereas this particular check cannot be made at the patient's bedside at present since the individual dose is not labeled.

General comments by both head nurses included reports of skepticism about the proposed system before the pilot operation and a decided preference for it following the experience. Several other nurses expressd regret that they could not continue with the proposed system.

Medication Errors. As a basis for further evaluation of effects of the proposed system on incidence of medication errors, we chose a study of such errors by Safren and Chapanis[1] as being far more comprehensive and penetrating than any similar study we could have attempted within the time and money available for the present work. Their study-hospital and this one are similar in that drugs are stored on nursing units and medications are prepared by nurses following procedures that appear, from their report, to be similar to those of the present system in this hospital. Also, pharmacists and members of the nursing committee who worked with the investigators found that causes of error or near-error enumerated by Safren and Chapanis agreed with experience in this hospital.

Therefore, nurses and pharmacists studied the report on medication errors to identify causes that would be affected by features of the proposed system. It is expected that the proposed system would be of significant value in avoiding errors or near-errors arising from the following underlying causes identified by Safren and Chapanis. The examples included below are from their discussion.

a. Similarity of drug names, such as digoxin and digitoxin.

b. Similarity of abbreviations used in dosage schedules (*q.n.* and *q.h.* - every night and every hour; *q.o.d.* and *q.d.* - every other day and every day.)

c. Problems in measurement in the preparation of medication (overlooking a decimal, calculating incorrectly or confusing units of measure such as mcg. (microgram) and mg. (milligram).

d. Poor arrangement of drug supplies.

e. Weaknesses in drug labels such as small print, ambiguity or illegible writing.

f. No record on the medication card or nursing care card that dose already has been administered.

g. Failure to check drug label with the corresponding medication card.

h. Interruption during preparation of medications.

Other underlying causes reported by Safren and Chapanis are unaffected by differences between the present and proposed systems now under study. These causes pertain to the physicians' written orders and to nurses' failure to check the medication card with either the physicians' order or with the nursing care card.

With respect to checking procedures, 36 percent of errors or near-errors in the Safren and Chapanis study resulted from failure to carry out checking procedures. Although the proposed system provides for additional checking and a second check of the drug and medication card, the faithful per-

*Some of the nurses reported that patients were curious about or interested in the "individualized" drugs.

formance of all checking procedures by nurses still would be necessary to benefit fully from features of the proposed system.

A comparative analysis of the incidence of medication errors under the present and proposed system would be of considerable value to the hospital field. In anticipation that the proposed system may be adopted, it would be worthwhile to collect complete and identical kinds of data under both systems.

Legal Responsibility. There are two aspects of the proposed system that seemed to require consideration from a legal point of view.

One is that in the proposed system drugs are dispensed in individual labeled doses ready for administration instead of in multiple-dose, labeled containers from which nurses prepare individual doses. According to Archambault[2] the dispensing of drugs includes the removal of drugs from their original containers and issuance in other containers that are properly labeled, whether the issue be one or more doses.

The other aspect pertains to any change in the degree of responsibility of hospital pharmacists under the proposed system in which pharmacists have more information about medications and patients than in the present system. On this question the chief pharmacist's investigation extended beyond review of literature to correspondence with authorities on legal aspects of pharmacy practice. The summary opinion in the following two paragraphs is paraphrased from letters of Bachelder[3] and has been edited by him.

The pharmacist is obligated under the laws of negligence and other laws governing the practice of pharmacy (a) to use due care in the filling of prescriptions, (b) before filling the prescription, to call to the attention of the physician any inconsistency or mistake which is, or should be, apparent to the pharmacist, and (c) to make no change in a prescription without authorization of the prescriber.

However, and depending upon the circumstances, the pharmacist's responsibility ordinarily would not be interpreted to extend to the checking of dosage or therapeutic incompatibilities. On the other hand, hospital authorities may assign such duty to its pharmacists and the pharmacists may, therefore, be provided with sufficient information to perform this duty. In this event, the more information the pharmacist has available to him within his area of specialized knowledge and the greater the duty so assigned to him, the greater his responsibility. Nevertheless, the responsibility continues, with possible rare exceptions, to be a civil one covered under the laws on negligence, under which a pharmacist may be liable for money damages for injuries resulting from carelessness.

Pharmacists in this hospital are willing to accept responsibility for additional checking of drug orders in respects for which their specialized training prepares them. In view of the increasing complexity of drug therapy, they want to use their experience in providing a safeguard in addition to the care excercised by both physicians and nurses.

Clinical Experience of Student Nurses. The proposed system practically eliminates the preparation of medications on the nursing unit where student nurses gain their clinical experience. In view of advantages of the proposed system, the nursing school administrators and faculty concluded that providing experience in preparation of medications could and should be adapted to the proposed system. The possibility of providing a concentrated period of practice in the pharmacy was considered but further planning is deferred until a decision is made on the choice of dispensing system.

Methods of Quantitative Measurement

Final sections of this report compare the two systems with respect to total volume of dispensing and prepackaging; the amount and salary value of time expended in the pharmacy, nursing service and business office; and staffing requirements and salaries in the pharmacy. General approach to study, mentioned early in this report, included: (a) determination of time spent per unit of activity by study of both systems in the pharmacy and on one nursing unit, (b) estimation of total volume of activity from available records and supplemental surveys, and (c) estimation of total time by applying unit time to total volume. Methods employed are described in this section.

Measurements of time included only the time required for those activities that differed in the two systems in the business office, pharmacy, and nursing service. Measurements excluded time spent by personnel of these departments in errands or interruptions and time spent in the activities of interest by the night supervisor or by general administrative personnel.

Pharmacy. In the pharmacy the time required under the two systems differs for several activities. The time required per day under the proposed system could not be measured in total since only one nursing unit was served by that system. For this reason, under each system, the time per unit of activity was determined from sample observations made at different times of the day over an elapsed period of one week under each system. Time was measured with stop watches by the nurse coordinator and by the pharmacists themselves. Each member of the pharmacy staff was observed and activities were timed during both rush and slack periods. The time required for auxiliary dispensing in central supply also was measured and is included in results on pharmacy activity.

Under each system, the number of observations of any one activity ranged from 432 on dispensing of drug packages to 10 on photocopying of cards. The number of observations accepted as an adequate sample depended on the significance of the activity to total results. Small samples were utilized of activities that occur with relative infrequency and require less than a minute per procedure or vary little in time per procedure.

The pilot operation did not provide experience in packaging and labeling by use of automatic equipment. Lacking experience in mechanical prepackaging, it was necessary to estimate the time required per package by use of output data reported by manufacturers. Allowances were made for change-over time in addition to running time.

The schedule for observation of the pilot operation allowed one week of practice before time was measured. The periods of observation coincided with the schedule for the nursing unit and will be reported in the following section.

Nursing Service. In nursing service where activity is segmented into nursing units, there was opportunity to observe both systems under fullscale operation insofar as one nursing unit is concerned. For this reason, all of the time spent in the activities of interest was measured on the days of observation and the average time per day was reduced to time per medication.

On the nursing unit, preliminary observations were made to define categories of activity for recording purposes, to determine method of recording and to identify points to stress in training of observers. Subsequent observations were made to try the method before the nurse-coodinator trained nurse observers.

The measured activities included handling of medication cards, ordering and storing of drugs, preparing medications, and carrying out procedures for narcotic control. (Measurements excluded unchanged activities: administering and charting medications or referring to nursing records except when using a medication card.) All activities of interest occurred at the nurses' station and medication counter. One observer, seated just outside of the nurses' station, could see

all the activity in this area after mirrors were mounted to bring into view the activity of persons who were facing away from the observer.

Time was measured with two stop watches mounted on the observer's clipboard. Observations were made during the day and evening shifts from 7:00 A.M. until 11:00 P.M. During the night shift, 12 percent of the medication activity occurs. For this period, time was estimated by applying the average number of medications during the night shift to the time required per medication on the day and evening shifts.

Final data included five days under each system. A longer period would be desirable if the objective were to compare the total time spent on the one nursing unit. However, five days was considered adequate for the objective of determining time per unit of activity.

Methods employed to maintain comparable study conditions while both systems were observed are summarized under the following three objectives.

The first objective was to keep the pilot unit as representative as possible of the entire nursing service. For this reason patients were admitted to the pilot unit from both the general medical and general surgical services. Also, members of the nursing staff who operated the pilot unit were selected to represent varied lengths of work experience and varied work paces.

The second objective was to maintain conditions under which the nurses who were observed could maintain comparable work paces while time was measured under both systems. For this reason, the same nursing staff operated each system, successively. (There were 3.6 hours of available nursing time per patient per 24 hours.) Also, the work-load of this staff was stabilized insofar as possible by maintaining a high, level census on the 30-bed pilot unit.

The work load was further controlled, after time had been measured for five days under the present system, by extending the measurement of time under the proposed system until data had been collected on five days that closely matched the first five with respect to nursing load. Indicators of nursing load for each nursing shift were: daily average census of patients exclusive of those with private-duty nurses, number of patients requiring intensive care and number of admissions, transfers and discharges. These numerical indicators were supplemented by a "level of activity curve"[4] that was drawn by the head nurse to indicate how busy the staff had been on the day and evening shifts.

The third objective was to maintain comparable conditions by scheduling sufficient time for orientation and for practice of the proposed system. The lengths and purposes of the time allowances are indicated in the following schedule.

1st Week: While the nursing unit still was operating under the present system, time was recorded by nurse observers to increase their skill and to accustom the nursing staff to the continuous presence of an observer. (Before this week, the nurse coordinator had been making preliminary observations and trying out methods of observation.)

2nd Week: Time spent in the present system was recorded for comparative purposes.

3rd Week: Still under the present system, the patient-census was kept at a low level to allow time for the staff to study the proposed system. Each staff member was given written procedures for the system and the supervisor and head nurse were supplied with questions and answers covering each procedure for use in checking learning progress. The pharmacy staff studied the procedures during this time, also.

4th Week: The proposed system was installed on Monday, the patient-census was increased, and the week was allowed for practice by the nursing staff, pharmacists and nurse observers.

5th Week: Time spent in the proposed system was recorded for comparative purposes.

6th Week: The present system was re-installed and the patient-census was kept at a low level for three days to allow time for each member of the nursing staff to write her evaluation of the two systems in the research office.

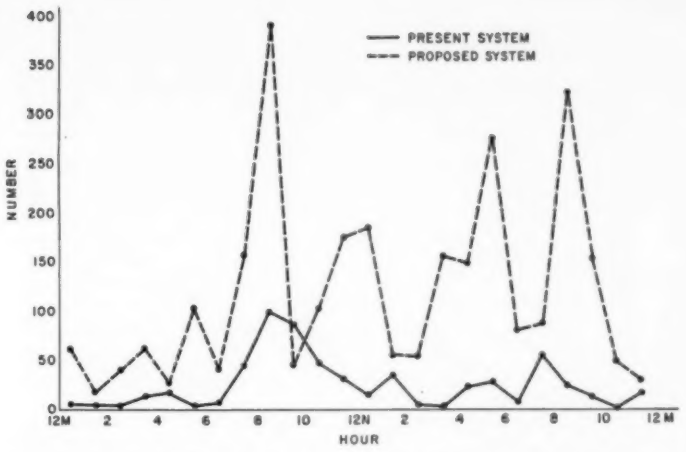


FIGURE 9. NUMBER OF DRUG ORDERS BY HOUR OF OCCURRENCE IN PRESENT AND PROPOSED SYSTEMS.—There are 587 orders per weekday in the present system and 2784 in the proposed.

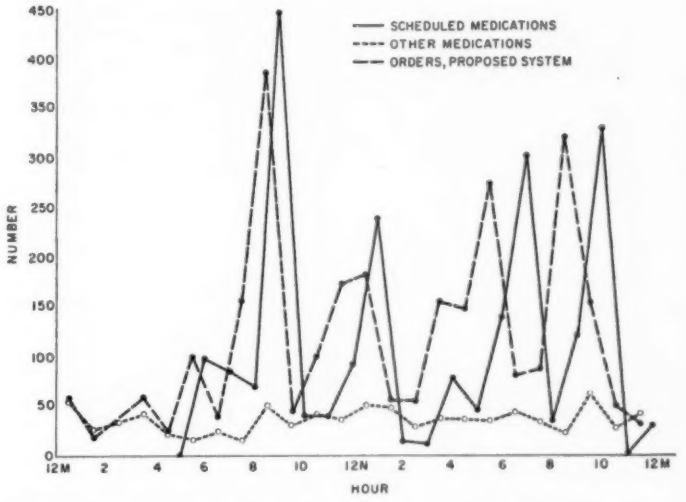

SCHEDULED MEDICATIONS
OTHER MEDICATIONS
ORDERS, PROPOSED SYSTEM
NUMBER
HOUR
12M 2 4 6 8 10 12N 2 4 6 8 10 12M
0 50 100 150 200 250 300 350 400 450

FIGURE 10. TIMING OF DRUG ORDERS IN THE PROPOSED SYSTEM IN RELATION TO TIMING OF MEDICATIONS.—There are two curves for the 3039 medications per day: the medications that are scheduled for administration at specific times and those that are to be given as need arises (77 and 23 per cent, respectively, of total medications). To supply these medications, the pharmacy dispenses 2784 issues per day (2695 single doses and the remainder in multiple-dose issues, accounting for fewer orders than medications). The peaks in ordering are not as steep as the peaks in regularly scheduled medications because (a) there are slightly fewer orders than medications, as just explained, and (b) regularly scheduled medications are ordered well in advance of the scheduled time of administration: two-thirds within the first preceding hour and one-third within the second preceding hour.

The plotting of medications and orders differs in the figure above because medications are plotted on the hour (of administration) while orders are plotted within the hour (they are received).

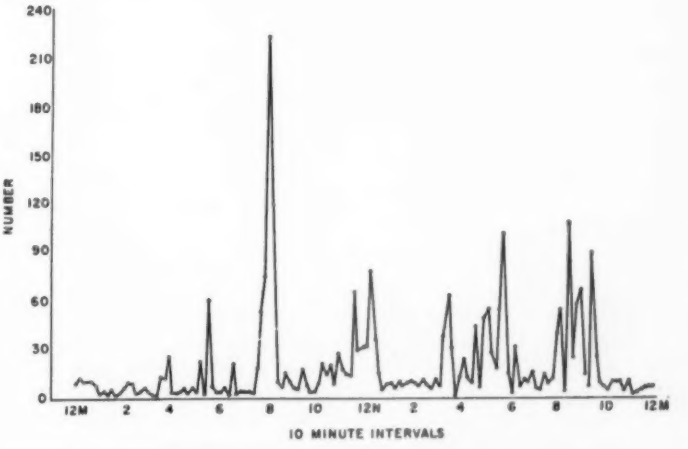


FIGURE 11. NUMBER OF DRUG ORDERS IN THE PROPOSED SYSTEM BY TEN-MINUTE INTERVALS.—There is a constant flow of orders throughout the 24 hours, capped by peaks at times when most of the advance orders are received for regularly scheduled medications. The orders received at 8:00 A.M. (the highest peak) and thereabouts are due on nursing units a few minutes before 9:00 A.M.

The working schedule outlined above made allowances for extension of any period if necessary to accomplish the objective of the week. However, it was not anticipated that one week of practice was sufficient time to gain optimal proficiency in procedures of the proposed system. In the attainment of skill in a single procedure, the typical relationship between practice and proficiency is rapid gain at first, no gain for a while, then very gradual gain over a relatively prolonged period of time. The total time spent in measured activities of the proposed system showed rapid gain on successive days for the first five days of practice, then no net gain throughout the remaining period of operation (although the time expenditure fluctuated from day to day as it did in the present system).

Additional gain in proficiency therefore is to be expected over an extended period of time, but it was not practical to prolong the pilot operation to reflect ultimate proficiency. This interpretation of data agrees with reports of both pharmacists and nurses that they had not gained optimal proficiency by the close of the pilot operation.

To this extent, reported time for the proposed system may be accepted as conservative. Results for the proposed system also are conservative in relation to those for the present system since the latter requires more time off the nursing unit and such time was not measured (night supervisor's time in getting packaged drugs from the pharmacy and occasional administrative time in conferences pertaining to narcotic control).

Business office. In this department time requirements were estimated instead of being measured precisely because (a) only two limited activities are affected by differences in the systems and (b) it was clear from preliminary study that time in this department would represent a small proportion of the total time of the three departments.

The number of vouchers to be processed is reduced from 721 to 86 per day in the proposed system. Estimate of the daily time required in the present system was determined from special recordings by the cashiers of the time they spent on 14 consecutive days in each step of voucher processing. The average census during this period closely matched the annual average. This estimate was used to determine the daily time requirement for the proposed system by applying known differences, as follows: some steps of the present processing would be eliminated, some would be reduced in direct relationship to the number of vouchers, while two steps would be reduced by an estimated 10 and 25 percent.

The other activity that differed was the elimination in the proposed system of pulling of vouchers from storage boxes and preparing of itemized drug charges. Persons who perform and who supervise the activity reported that one occurrence may require from a few minutes to several hours and occurrences are infrequent and sporadic (none for a few weeks, several in a week). The significance of the activity to total results did not justify the recording of time expenditure over several months to gain a valid sample. Instead, the employees' estimate of 10 minutes daily average was accepted.

Table 1. MEDICATIONS: NUMBER AND CHARACTERISTICS

For the Average Census of 376 Patients[a]		For General Medical and Surgical Patients on One Nursing Unit[b]	
Total number per day	3039	Percent of medications by method of administration:	
Number per patient per day:		Oral	
All services	8.1	Regular	78.7
Intensive care unit-mixed services	10.9	Tube	2.8
Deluxe unit-mixed services	6.4	Subcutaneous	1.8
General medicine and surgery	8.8	Intramuscular	10.5
Urology	6.6	Intravenous	
Gynecology and vascular service	6.7	Base solution only	2.4
Orthopedic and plastic services	6.6	Base solution with additives	1.6
Proctology	6.0	Other	1.2
Cardiology and neurology	8.2	Suppositories	0.6
Eye	4.8[c]	Topical	0.1
ENT and vein services	4.4	EENT applications	0.3
Dermatology	17.3		100.0
Number of different kinds of drugs patients receive per day:		Percent of medications by functions of the drugs:	
On the day of admission	2.2	Specific to diagnosis	34.3
On the day of dismissal	0.7	Nourishment (IV & vitamins)	17 4
On intervening days	4.1	Specific & nourishment	0.7
On all days combined	3.9	Relief of pain	18.8
		Relief of anxiety or nausea	8.3
		Promotion of sleep	10.2
		Promotion of elimination	5.1
		Preparation for surgery	
		Treatment	0.9
		Other	4.3
			100.0

[a] Source: One day's count adjusted as described in the text under "Methods—Total Volume."

[b] Source: 1840 medications administered to patients on general medical and surgical services during 10 full days of the two weeks the proposed system operated on the pilot unit. The data are from the revised medication cards (Figure 1).

[c] It must be assumed that this rate is not representative of average experience because (a) the number of medications on this service fluctuates widely from day to day and (b) the rate is from one day's count. (See Footnote[a] above). An adequate sample on this service would include several months.

Total volume. The following examples illustrate the use of surveys in estimating total volume of activity.

1. To determine the number of orders to be expected in the proposed system, available records supplied the total number of present issues of (a) prescriptions filled for departing patients, (b) drugs for use in the hospital that, in the proposed system, would continue to be issued in multiple doses (ointments, lotions, sprays), and (c) drugs that, in the proposed system, would be issued in single instead of multiple doses. The missing fact was the number of single doses represented in the latter group and this fact was determined from a hospital-wide survey of charted medications.* In the survey, medications were tallied under various classifications to yield other essential information as well.

2. To determine when orders occur, the timing of present orders in the pharmacy and central supply was tabulated for one week and the percentage distribution by hour of occurrence was applied to the average number of orders per day for the latest fiscal year. To determine when orders would be received in the proposed system, a special recording was made while the proposed system operated. The number of orders for single doses was recorded for each ten-minute interval throughout the 24 hours for 10 full days of the pilot operation, resulting in a sample of 1810 single doses. The percentage distribution by time of occurrence was applied to the total number of single doses throughout the hospital (from Item 1 above). To complete the picture, prescriptions for departing patients were scheduled when they now occur. Multiple-dose issues in the proposed system were added during slack periods of the day, since orders for drugs such as ointments and lotions usually do not require immediate attention.

*The survey included medications administered to patients who were in the hospital during any part of one 24-hour period. The count for each clinical service was adjusted to represent the service's daily census for the latest fiscal year. The resulting total was accepted as a reasonable estimate of average experience after checking two subtotals with known daily usage: the number of intravenous fluids in the sample matched known daily usage closely and the number of narcotics administered agreed exactly with known daily usage.

3. To provide the pharmacist with guides for estimating staffing requirements under the proposed system, the difference in time requirements for the present and proposed system was supplemented by a schedule of the time required for dispensing activities during each of the 24 hours. The time required for all dispensing activities (activities that must go on as orders are received) was reduced to time per order for the pharmacist and for the clerk and these unit times were applied to the number of orders within each hour (from Item 2 above).

These examples suffice to indicate how survey data was used in extrapolations to estimate total volume of activity in the proposed system.

Procedures. Major steps in the conduct of study are apparent or implied in foregoing discussion. Worthy of special mention is the initial time-consuming step of writing procedures for the present and proposed systems. The basic procedures of the present system are quite simple but a complexity of modified procedures exists to meet special conditions such as urgency of need, advance ordering of drugs for injections to be available for physicians who administer them, and self-administration of antacids and nitroglycerin tablets by patients. It was delving into details of special procedures that enabled the investigators to identify the requirements that the proposed system had to satisfy. As a result of this time-consuming step, all conditions encountered during the pilot operation were covered in the written procedures for the proposed system.

Pharmacy Orders

The number of orders to be dispensed per day for the entire hospital is 2784 in the proposed system and 587 in the present system. The 2784 orders in the proposed system are for 2695 single doses (92 percent), 53 multiple-dose issues for hospital use and 36 prescriptions that are ordered for patients as they are being dismissed. The orders just reported are averages for weekdays. The number of orders on Saturday or Sunday usually is smaller and, therefore, these days were excluded before determining an average to show a realistic picture of weekday activity.

Curves in Figure 9 (page 551) show the hourly contrast in

Table 2. PACKAGING COSTS[a] FOR TABLETS AND CAPSULES[b] IN THE TWO SYSTEMS

Cost Bases	Present System		Proposed System
	Actual Multiple-Dose Package	Per Dose	Per Dose
Unit cost			
Labor and material	.03992¢	.00236¢	.00093¢
Depreciation of equipment over 5 years			
Present $300 labeling machine[c]	.00194	.00011	—
One available and suitable automatic machine costing $6,255—for packaging and labeling	—	—	.00165
Total:	.04186¢	.00247¢	.00258¢
Annual cost			
For 44,314 packages representing 751,000 doses of tablets and capsules	$1855.00		
For 751,000 doses of tablets and capsules			$1938.00

[a]These costs include drugs that are packaged in multiple doses in the present system and in single doses in the proposed system. The costs exclude the multiple-dose issues that remain the same in the proposed system—that is, (a) issues of ointments and similar drugs that cannot be ordered in discrete quantity per dose, and (b) the occasional prescription for a patient who is being dismissed.

[b]Tablets and capsules are 93 percent of the oral doses to be packaged. Complete costs are not available on the remaining 7 percent of the oral doses that are liquid.

[c]This machine is paid for but is included for comparative purposes.

Table 3. PHARMACY: NUMBER OF SECONDS PER UNIT[a] OF AFFECTED ACTIVITIES IN THE TWO SYSTEMS

	Present System			Proposed System		
		Seconds Spent by:			Seconds Spent by:	
Activity	Unit of Measure	Pharmacist	Clerk	Unit of Measure	Pharmacist	Clerk
Check drug order	—	—	—	1 new order	12	38
Dispense	1 package[b]	22	19	1 dose[b]	10	10
Procedure for Narcotic control	1 package	9	150	1 dose	—	33
	Per day[c]	—	1800	Per day[d]	600	—
Post charges on inactive medicine cards	—	—	—	1 card	—	18
Charge	1 package	—	22	1 account	—	109
Returns	1 package	24	26	1 package	10	10
Combine drugs (additional)	—	—	—	1 bottle IV fluid	120	—
				1 syringe	60	—
Package during dispensing (occasional)	1 package (label in dispensing)	20	—	1 package	28	—
				1 label	17	—
Prepackage multiple dose by hand:				1 package (ointments, drops, and the like)	—	140 (est.)
Tablets & capsules	1 package	—	26			
Liquids	1 package	—	40			
Ointments	1 package	—	165			
Suppositories	1 package	—	26			
	Per day[d]	300	—	Per day[d]	360	— (est.)
Prepackage single dose by hand (occasional)	—	—	—	1 package	—	12 (est.)
				Per day[d]	360	0 (est.)
Prepackage single units by machine	—	—	—	Per day[d]	360	5520 (est.)

[a] The unit time was determined from samples ranging from 10 photocopies to 432 packages dispensed, as discussed in the method of estimating time in the pharmacy.

[b] In the present system a typed label is required to identify the patient, in addition to the drug label that already is on the prepackaged item. In the proposed system, however, no label to identify a patient is necessary since the prelabeled drug is placed with the medication card. A clerk places a drug packet with each card; the pharmacist checks drug with card and initials the card.

[c] This is estimated time required per day for a clerk to deliver narcotics to each nursing unit and obtain the signature of the receiving nurse. Although other errands were not included in pharmacy or nursing time because the errands will not be necessary in a new building, this particular daily errand would continue to be necessary under the present system.

[d] The time per day for the pharmacist is time required for inspection.

volume of ordering in the two systems. For the proposed system only, the three curves of Figure 10 show the relation between hourly occurrence of ordering and of administration of scheduled and unscheduled medications. Although administration of unscheduled medications is an intermittent activity on one nursing unit, it is a fairly constant activity for all nursing units combined, indicating a fairly steady flow of orders for these medications. The administration of scheduled medications, on the other hand, is represented by great peaks occurring on the established hours for this activity. The peaks in ordering precede the peaks in administration but are not so steep because orders for scheduled medications are received over the two hours preceding administration. The single curve in Figure 11 shows the volume of ordering in the proposed system by ten-minute intervals. This curve shows more clearly the constant flow of orders with peaks more concentrated than the hourly plottings indicate.

The volume and peaks of dispensing represent a challenge in the proposed system. Can the pharmacy dispense 2784 medications per day with care and dispatch? About 17 percent of the orders are initial orders that a pharmacist must check to clear them for dispensing. Also, a small proportion of the orders are for drugs that must be compounded or packaged as orders are received.

It does seem that the volume of orders can be handled expeditiously since (a) the maximum number of items to be dispensed within any hour is 387 between eight and nine o'clock in the morning, (b) most of these orders are received about eight o'clock and are due on nurses' stations a few minutes before nine, (c) within one hour a pharmacist and a clerk can dispense 360 packaged doses that are within arm's reach and previously have been approved for issue (Table 3), (d) there will be at least two active dispensing centers during peak loads, (e) orders will be assigned to each center in such a way that proper attention can be given to unscheduled medications that are to be delivered immediately, and (f) there will be a receiving station from which a clerk will dispatch orders according to the types that are being handled at each center.

Efficient operation of the system depends significantly on ingenious layout and equipping of the pharmacy, as the preceding paragraph may have implied. Also, the proposed

Table 4. THE THREE DEPARTMENTS: SUMMARY OF HOURS SPENT IN AFFECTED ACTIVITIES IN THE TWO SYSTEMS

Categories of Activity	Nursing Service		Pharmacy[a]		Business Office		3 Departments	
	Present	Proposed	Present	Proposed	Present	Proposed	Present	Proposed
Handling medications (see breakdown below)	31.2	8.1	8.0	29.9	—	—	39.2	38.0
Ordering, writing and checking medication cards, maintaining supply[b]	28.2	29.8	—	—	—	—	28.2	29.8
Narcotic control	17.3	1.9	2.0	2.7	—	—	19.3	4.6
Charges and credits	4.3	0.7	2.8	4.1	6.0	1.1	13.1	5.9
Totals:	81.0	40.5	12.8	36.7	6.0	1.1	99.8	78.3
Breakdown of category "Handling medications:"								
Packaging drugs	—	—	2.2	3.8	—	—	2.2	3.8
Dispensing drugs	—	—	5.8	23.4	—	—	5.8	23.4
Combining drugs	(in item below)		—	2.7[c]	—	—	—	2.7
Preparing and checking medications[d]	31.2	8.1	—	—	—	—	31.2	8.1

[a] Includes auxiliary service in central supply.

[b] The kinds of activities in this category differ between the two systems. For example, a drug order is written in the present system whereas the revised medication card is used for ordering in the proposed system. A drug record is prepared for each admitted patient in the proposed system and there is no corresponding activity in the present system.

[c] This is additional time for the combining of drugs that are combined on the nursing unit in the present system.

[d] This does not include any time spent in checking medications in patients' rooms.

system requires more space than the present one for dispensing, for packaging, and for storage of drugs and medications trays. It is probable, however, that reduced space and equipment requirements on 15 of the 17 nursing units* more than offset additional requirements in the pharmacy, since the proposed system eliminates need for a special medication counter, for narcotic cabinets, and for refrigerator and other storage space for drugs.

Prepackaging

Of the 2784 orders dispensed per weekday in the proposed system, 86 percent are prepackaged in the pharmacy, 12 percent are vendor-packaged, and 2 percent are packaged as they are dispensed. Of the 587 orders per weekday in the present system, 28 percent are prepackaged in the pharmacy, 56 percent are dispensed in the packages in which they are purchased, and 16 percent are packaged at the time they are dispensed. The items that are vendor-packaged in both systems consist principally of bottles of intravenous base solution and drugs that are available in disposable syringes.

Prepackaging is done from Monday through Friday. The number of prepackaged items per weekday is 2527 in the proposed system and 162 in the present.

Most of the drugs to be prepackaged in the pharmacy are tablets and capsules. The present cost of manual prepackaging of multiple doses was reduced to a per dose basis for comparison with the mechanical prepackaging of single doses in the proposed system. The cost per dose is .00258c in the proposed system and .00247c in the present. Cost includes labor, materials and equipment, assuming a five-year period of depreciation. The annual cost for prepackaging these items is $1,938 in the proposed system and $1,855 in the present (Table 2).

Separate equipment is required for liquid drugs. One available machine that fills packages, but does not cap them, costs $400. But the unit cost cannot be calculated at this time since presently available containers are not economically practical for fullscale operation of the system. However, at least two firms are experimenting now with inexpensive disposable drinking containers that are suitable for drugs.

Available information indicates that the annual cost of prepackaging individual units of drugs is about $1,000 more than present costs of prepackaging multiple doses. However, this comparison does not take into account a saving in the proposed system of medicine glasses and paper containers that now are used in preparing medications on nursing units.

Since drug manufacturers already have made drugs available in single ampuls and disposable syringes, the question may arise as to whether it would be more practical for the hospital to purchase other drugs in dispensing units if they became available. Problems in such plan include the following.

1. Bulk drugs still would be required for special compounding and for the occasional prescription for a departing patient. To purchase the same quantity of drugs, the price might be more for limited bulk quantities plus dispensing units than for bulk quantities alone.

2. Liquid drugs for oral administration would present a special problem to the manufacturer because a variety of dosages is required. Also, it might not be practical to ship liquid doses in inexpensive, disposable drinking containers.

*Space and equipment requirements may not change on nursing units for eye service, for example, where many drugs would continue to be issued in multiple doses.

The dosages available from the manufacturer probably would need to be supplemented by prepackaging in the hospital.

3. With prepackaging by the hospital, nurses learn to open one kind of packet for tablets and one kind of container for liquids. It is natural to expect individuality in the packages of manufacturers, however, and nurses' work would be slowed down by a variety of packages that open in different ways.

4. The hospital's label on individual doses will contain only the name of the drug and the dosage in bold print, whereas this information sometimes cannot be located readily on the commercial label because the drug name and dosage may be (a) less prominent than the manufacturer's name, (b) in small print, or (c) obscured by surrounding print. Quite small commercial labels might be less readable than present ones since a manufacturer must meet regulatory requirements regarding minimum content of its drug labels.

5. Thus far, manufacturers have not attained the degree of uniformity in labeling that the hospital expects to realize. For example.

a. Metric measures will be used, eliminating use of apothecary measures.

b. The nonproprietary name of a drug will be used when necessary to avoid confusion from different trade names for the same drug.

c. A standard style will be used in stating dosage to avoid confusion that arises, for example, when 2 cc. of a drug for injection is described on one commercial label as 2.5 mg. per 2 ml. while on another it is described as 1.25 mg. per 1 ml.

Certainly drugs in ampuls and disposable syringes represent a decided improvement over former methods. If manufacturers are interested in packaging more drugs in dispensing units, they may want to overcome barriers such as those pertaining to standardization and readability of labels. Even so, some prepackaging would be required in the pharmacy.

Time Requirements

Pharmacy. The unit time for each measured activity is in Table 3. The total time for broad categories of activity for the three departments is in Table 4.

Pharmacy activities that differ in the two systems require 36.7 hours daily in the proposed system and 12.8 hours in the present. A tripling of time in the proposed system is accounted for primarily by an increase in dispensing time from 5.8 to 23.4 hours daily. Other activities also require more time in the proposed system. Prepackaging increases about 15 times in volume yet requires 3.8 hours daily by machine compared with 2.2 hours at present by hand. There are 273 single doses of narcotics to dispense daily in the proposed system compared with 30 multiple-dose issues in the present system yet the time required in the proposed system for the simpler procedure is 2.7 hours daily compared with 2.0 hours in the present system.

The time spent by pharmacists is 37 percent of the total measured time in the proposed system compared with 26 percent in the present (Table 5). This is because pharmacists, rather than assistants, do all combining of drugs and must perform certain steps in dispensing, and the greatest increases in time requirements are in these activities.

Nursing service. On the five days during which final data were collected for each system on the pilot unit, the average patient census was 26.2 under the proposed system and 26.6 under the present. The number of medications per 24 hours was 174 in the proposed system and 162 in the present. Twelve more medications per day under the proposed system is accounted for by the fact that the census of medical patients, who received more medications per day, was slightly higher under the proposed system. This difference, however, was not significant with respect to total nursing load and was not significant to final results since the time per medication was used in estimating time requirements for the entire hospital.

The time spent by nurses per 24 hours in the medication activities that differed in the two systems was 137 minutes in the proposed system and 253 in the present. Per medication, the time was 0.8 minutes in the proposed system and 1.6 in the present. This 50 percent saving is somewhat greater than the saving of time in total or per patient because of the additional medications given under the proposed system (Table 6).

Table 5. THE THREE DEPARTMENTS: NUMBER OF HOURS AND PERCENTAGES OF TIME SPENT IN AFFECTED ACTIVITIES BY PROFESSIONAL AND NONPROFESSIONAL PERSONNEL

Departments	Professional		Student		Nonprofessional		All Personnel	
	Present	Proposed	Present	Proposed	Present	Proposed	Present	Proposed
Number of hours:								
Nursing service—pilot unit	(3.2)	(1.8)	(0.8)	(0.5)	(0.2[a])	(0.0)	(4.2)	(2.3)
Nursing service—entire hospital[b]	61.7	31.7	15.4	8.8	3.9[a]	0.0	81.0	40.5
Pharmacy—entire hospital	3.3	13.4	—	—	9.5	23.3	12.8	36.7
Business office—entire hospital	—	—	—	—	6.0	1.1	6.0	1.1
Totals for entire hospital:	65.0	45.1	15.4	8.8	19.4	24.4	99.8	78.3
Percentage distribution of the time:								
Nursing service	76.2[c]	78.3[c]	19.0	21.7	4.8	0.0	100.0	100.0
Pharmacy	25.8	36.5	—	—	74.2	63.5	100.0	100.0
Business office	—	—	—	—	100.0	100.0	100.0	100.0
The three departments:	65.1	57.6	15.4	11.2	19.5	31.2	100.0	100.0

[a] Nonprofessional personnel in nursing includes only ward clerks insofar as affected activities are concerned. Nurse aides go on errands for drugs but this time was not included. Practical nurses do not perform medication activities in this hospital. Although there are several practical nurses on the nursing staff, none was working in the pilot unit.

[b] The percentage distribution on the pilot unit was applied to total time estimates to derive the distribution by type of personnel for the entire nursing service.

[c] These percentages are from the pilot unit. In calculating effects of the system on such matters as professional nurses' salaries, 75 percent was used under both systems to represent the professional nurses' proportion of estimated total time requirements.

Remarkable savings in time under the proposed system occurred in preparing medications, in controlling narcotic supply and in charging and crediting. A few more minutes per day, however, were spent in the proposed system in the category of activities that includes the writing, filing, selecting and checking of medication cards with the physicians' order book and with nursing care cards (Table 6).

The slight increase in time required to handle medication cards in the proposed system was due, basically, to the fact that the revised card is appreciably larger than the present one. Although present cards are kept with nursing care cards in the Kardex files, the revised cards, being larger, were kept in an improvised flat file box. The handling of the revised cards continued to be awkward for the nurses and the learning time for this activity did not decline sharply during the practice period as did time for other activities. Less time would be required after more practice with an efficient filing arrangement.

Turning now to the entire hospital, the estimated time required for 3039 medications daily is 40.5 hours in the proposed system compared with 81 in the present for those activities that differ between the two systems (Table 4).

About three-fourths of the time is spent by graduate professional nurses and about one-fourth by professional student nurses (Table 5). The time spent by graduate professional nurses per day represents the full working time of 4.1 persons in the proposed system compared with 8.1 in the present. These persons are 4.6 and 9.0 percent, respectively, of the professional staff nurses on duty daily.

The extent to which a saving in salary cost would be realized from the saving in time is influenced by the fact that the time saved on one nursing unit is not great. Moreover, the saving is spread over three nursing shifts. A reasonable consideration of this question can be based on the experience on a nursing floor of 75 beds, for instance, wherein the staffing assignments are adjusted to the relative demands on the different nursing units that comprise the floor. On such a floor the saving under the proposed system would be 2.1 hours on the day shift, 2.2 hours on the evening shift and 0.5 hours on the night shift.*

Whether the saving in time would result in reduced staffing and corresponding saving in salaries depends upon various circumstances which are expressed in the following propositions. If staffing were inadequate on such a floor, the saving in time might be expected to result in (a) a lessening of pressure and tension, (b) a lessening of need to employ more nurses and increase the payroll, and/or (c) a saving in overtime pay. In this latter connection, several nurses on the pilot unit mentioned that they finished their work on time under the proposed system whereas they frequently worked 30 to 45 minutes overtime under the present system.

*Basis of estimate: Average of 60 patients at 80 percent occupancy; 8.1 medications per 24 hours, entire hospital experience (Table 1); distribution of these medications to the three shifts on the basis of experience in the pilot operation (Table 6); 0.8 and 1.6 minutes per medication, proposed and present systems, respectively; 75 percent of the time by graduate professional nurses.

Table 6. ONE NURSING UNIT: NUMBER OF MEDICATIONS AND NUMBER OF MINUTES SPENT IN AFFECTED ACTIVITIES IN THE TWO SYSTEMS PER SHIFT PER DAY (AVERAGES OF FIVE DAYS)

	Day Shift		Evening Shift		Night Shift		24 Hours	
Medications and Time	Present	Proposed	Present	Proposed	Present	Proposed	Present	Proposed
Number of Medications:								
Total	64.4	73.8	79.2	79.6	18.2	20.2	161.8	173.6
Number of patients	25.6	26.7	26.2	26.0	26.6[a]	26.2[a]	26.6[a]	26.2[a]
Number of medications per patient	2.5	2.8	3.0	3.1	0.7	0.8	6.1	6.6
Time expended:								
Total number of minutes	106.0	56.8	114.5	64.3	32.8[b]	16.0[b]	253.3	137.1
Number of minutes per medication	1.6	0.8	1.4	0.8	1.8[b]	0.8	1.6[c]	0.8[c]
Number of minutes per patient	4.1	2.1	4.4	2.5	1.2	0.6	9.5	5.2
Time spent by professional nurses as percent of total working time of professional nurses	5.3[d]	3.0[d]	8.4[d]	4.8[d]	7.3[d]	3.6[d]	6.6[d]	3.6[d]
Breakdown of total minutes by category of activity:								
Ordering, writing and checking medication cards, maintaining supply[e]	35.3	39.2	40.5	49.5	12.2[b]	12.2[b]	88.0	100.9
Preparing medications[f]	38.6	13.6	45.8	11.0	13.3	2.7	97.7	27.3
Carrying out procedures for control of narcotics	19.2	3.0	27.6	2.4	7.3	1.1	54.1	6.5
Charging and crediting drugs (see total above)	12.9	1.0	0.6	1.4	0.0	0.0	13.5	2.4

[a] The 24 hour count of patients is at midnight. The number of patients on the night shift is the same because all patients remained throughout that shift.

[b] Estimated from results on the other two shifts. In the proposed system the time per medication is highest at night because there are fewer medications to share the constant time required for inventory of narcotics.

[c] The time per medication is exactly half for the proposed system. The difference between systems is somewhat less in total, per patient, or percentagewise because these bases reflect about 12 additional medications per day under the proposed system.

[d] These percentages reflect the time of the head nurses as well as the professional staff nurses. For this reason, the percentages for 24 hours are lower than those stated in the report for the entire hospital for professional staff nurses only.

[e] Differences in activities under the two systems are mentioned in Footnote[b], Table 4.

[f] Preparing medications includes checking of medication with medication card at the nurses' station or medication counter, but not in patients' rooms.

Table 7. PHARMACY: STAFFING AND SALARIES UNDER THREE ALTERNATIVE PLANS

Pharmacy Personnel and Salaries Involved	Present System 72 Hours a Week	Present System 168 Hours a Week	Proposed System 168 Hours a Week
Pharmacy staffing			
Pharmacists	4.0	6.0	8.0
Technicians	1.0	1.0	1.0
Clerks	2.5	2.5	4.7
Totals:	7.5	9.5	13.7
Pharmacy salaries	$38,730.	$51,450.	$71,004.
Less salary savings under proposed system:			
Nursing service $19,135			−22,268.
Business office $3,133[a]			$48,736.
Less present pharmacy salaries:		−38,730.	−38,730.
Net additional salaries:		$12,720.	$10,006.

[a] Annual salary value of the business office time is $3832 in the present system and $699 in the proposed. The saving is expected to be realized in a new building.

If, on the other hand, staffing were adequate, it is doubtful that a saving of 0.5 hours per floor during the night shift would result in a reduction in staffing requirements. However, a saving of two hours per shift per floor on the day and the evening shifts might very well reduce the number of part-time persons who augment the fulltime staff. Administrative nurses concur in this expectation since it is the simultaneous occurrence of scheduled medications and other concentrated activity that creates the need for part-time nurses and dictates the hours they are asked to work.

The annual salary value of the time expended by professional graduate nurses is $21,500 in the proposed system compared with $43,000 in the present, a difference of $21,500. On the basis of foregoing discussion it is assumed that salaries would be saved during the day and evening shifts but not during the night shift. On this assumption $19,135 would be saved in nursing salaries.

Business office. To process vouchers and assemble supplemental information about drug charges requires 1.1 hours daily in the proposed system and 6 hours in the present (Table 4). An annual salary saving of $3,133 is expected in this department.

Total time. For the activities that differ in the two systems, 78 hours daily are required in the proposed system by the three departments compared with 100 hours in the present. In the packaging, dispensing and preparing of medications about the same amount of time is required in both systems but about four-fifths of the time is spent by pharmacists and their assistants in the proposed system while about four-fifths is spent by nurses in the present system. Narcotic control takes about one-fifth as much time and charges and credits about one-third as much in the proposed system as in the present. The saving in these latter activities accounts for the over-all saving of about 22 hours daily in the proposed system (Table 4).

Pharmacy Staffing and Salary Cost

Consideration is being given to operating the pharmacy continuously in a new building, whichever system is used. For this reason the present system operating 72 hours a week is compared with continuous operation of both the present and proposed systems. With either system, additional staffing arises from operating the pharmacy 168 hours a week instead of 72 at present. Additional staffing in the proposed system also arises from the additional 23.9 hours time it requires.

Staffing needs for the present system, for the same system operating continuously, and for the proposed system operating continuously are, respectively: 7.5, 9.5 and 13.7 persons of which 4, 6 and 8 are pharmacists. In the same order, annual salary costs are: $38,730, $51,450 and $71,004. However, an annual saving of $22,268 is expected in nursing and business office salaries in the proposed system. Therefore, the net additional annual salary cost of the proposed system is $10,006 compared with $12,720 for continuous operation of the present system (Table 7).

Summary and Comments

This study compared two pharmacy systems: the present one in which drugs are prepackaged manually and dispensed in multiple doses and a proposed system in which automatic equipment is used to prepackage and prelabel single units of drugs that are dispensed shortly before they are to be administered.

The pilot operation did not test the ability of the pharmacy to handle peak loads of the proposed system in full-scale operation. Analyses indicate that the system can function efficiently if (a) facilities are tailored to the system, (b) activities are well organized, and (c) nurses continue to order scheduled medications well in advance of the time for administration. Nurses who collaborated in developing procedures said this requirement fitted present practice and would work quite naturally, which it did.

Even so, consideration might be given by physicians and nurses to staggering medication hours on different nursing floors, as suggested by some nurses. This would level peaks in dispensing and it is possible that fewer pharmacists would be required under such plan. Certainly pharmacists' time could be concentrated even more in professional activities.

The proposed system was found to be workable. It meets legal requirements with respect to narcotic control. It requires that pharmacists do all checking of drug orders for which they are legally responsible, plus additional checking. It eliminates practically all clinical experience of student nurses in the preparation of medications on nursing units and requires that equally effective experience be provided by other means. It requires 78 hours of time daily compared with 100 for the present system for those activities that differ between the systems. It costs about $1,000 more annually for prepackaging but eliminates present costs of medication containers on nursing units. It requires more pharmacy space and equipment than does the present system but there are offsetting savings of space and equipment on nursing units.

Whichever system is adopted, consideration is being given to continuous operation of the pharmacy in a new building. Therefore the following comparison assumes continuous operation under either system.

The present system operating continuously costs an additional $12,720 annually in pharmacy salaries and offers the following advantages over the present system operating 72 hours a week.

1. Makes dispensing and advice from pharmacists available continuously.
2. Enables pharmacists to dispense all drugs and intravenous fluids since auxiliary dispensing by central supply would be unnecessary.

In the proposed system it is assumed that salary savings in nursing service and business office offset some of the additional annual cost of pharmacy salaries. The proposed system (that must operate continuously) costs $10,006 net in additional pharmacy salaries and offers the following advantages over the present system operating 72 hours.

1. Same as 1 above.
2. Same as 2 above.
3. Increases patients' safety through various safeguards in the handling of drugs (see pharmacists' evaluation and discussion of medication errors).
4. Saves graduate professional nursing time equivalent to that of five and a half nurses* but requires four additional pharmacists.
5. Helps to level peak nursing loads.
6. Simplifies procedures and increases efficiency in drug purchasing, drug inventory control, narcotic control, avoidance of drug waste and avoidance of late charges.
7. Is preferred by both pharmacists and nurses who participated in the pilot operation.
8. Provides source data for teaching and research in drug therapy.

In considering relative advantages of the systems, it should be borne in mind that in the present system, operating present hours, there could be additional checking by pharmacists on drugs dispensed for individual patients but not on drugs administered from general supplies on nursing units. This is true also of the present system operating continuously and, in addition, the narcotic control procedure of the proposed system could be incorporated into the present system if it operated continuously.

However, a serious disadvantage of the present system in continuous operation is that it creates demand for two more pharmacists without utilizing fully their knowledge and skills. There would not be enough work during half of the 24 hours for both a pharmacist and a clerk and clerical tasks would be performed by pharmacists. The proposed system, on the other hand, concentrates such activity as advance combining of drugs in the quieter hours and provides sufficient volume of dispensing to justify clerical assistance. Therefore the proposed system makes professional use of pharmacists' time while also saving professional nursing time.

A principal disadvantage of the proposed system is lessening the attractiveness of the pharmacist's position by requiring rotation of night duty. However, this disadvantage may be offset in the opinion of some pharmacists by increased work satisfaction such as that experienced by pharmacists in the pilot operation of the proposed system. A disadvantage not previously mentioned is that the proposed system differs considerably from that used in most hospitals, increasing the time required for orientation and training of incoming and departing nurses.

If the proposed system should be selected for future installation, we recommend the following.

1. Adopt mechanical means of posting drug charges, if practical.
2. Study (a) the use and value to pharmacists of copies of physicians' drug orders for checking purposes and (b) mechanical means of transmitting copies of such orders to the pharmacy.
3. Compare incidence and causes of medication errors or near-errors under the present and proposed systems.
4. Plan and conduct a thorough program of orientation, training and followup to achieve smooth transition from the present to the proposed system.

*The saved time representing that of four staff nurses daily, as reported earlier, is equivalent to 5.6 fulltime persons working 40 hours a week, 50 weeks a year.

References in Text

1. Safren, M. A. and Chapanis, A.: A Critical Incident Study of Hospital Medication Errors, *Hospitals* (May 1) 1960 and (May 15) 1960.
2. Archambault, G. F.: The Law of Hospital Pharmacy, *Am. J. Hosp. Pharm. 15*:593 (July) 1958.
3. Letters of Bachelder, R. H., L.L.B., Special lecturer in pharmaceutical jurisprudence, College of Pharmacy, University of Minnesota, Minneapolis, (Nov.) 1960.
4. Sturdavant, M. and collaborators Carr, D. T. *et al., Comparisons of Intensive Nursing Service in a Circular and a Rectangular Unit,* American Hospital Association Monograph Number 8, Chicago, 1960, pp. 62-4.

General References

1. Anderson, R. D.: Proposed Safety Standards for Hospital Medication Procedures, *Am. J. Hosp. Pharm. 16*:589 (Nov.) 1959.
2. Archambault, G. F.: Qualifications and Responsibilities of Lay Help in The Hospital Pharmacy, *Am. J. Hosp. Pharm. 15*:210 (Nov.) 1958.
3. Bogash, R. C.: Compatibilities and Incompatibilities of Some Parenteral Medication, *Bull. Am. Soc. Hosp. Pharm. 12*:445 (July-Aug.) 1955.
4. Bogash, R. C.; DeLaChapelle, N.; Sowinski, R.; and Downes, D.: Disposable Type Vials for Adding Medications to Large Volume Parenterals, *Am. J. Hosp. Pharm. 17*:104 (Feb.) 1960.
5. Brown, R. E.: Some Forces That Will Affect Hospital Pharmacy, *Hosp. Management 89*:92 (Apr.) 1960.
6. Carner, D. D.: A New Concept in Hospital Pharmacies, *Tile and Till 46*:opp. 24 (Mar.-Apr.) 1960.
7. Gerald, Sister Mary: Distribution System Saves Running Time, *Modern Hosp. 92*:85 (June) 1959.
8. Godley, L. F.: Rx Folders—A New Method of Ordering, Issuing and Charging Drugs, *Hosp. Management 79*:4 (Apr.) 1955.
9. Heard, J. S.: Considerations in Inpatient Dispensing, *Am. J. Hosp. Pharm. 15*:388 (May) 1958.
10. *The Hospital Formulary System,* (Oct. 16) 1960, a collection of articles reprinted from *Hospitals,* with a Statement of Guiding Principles Approved by the American Hospital Association and the American Society of Hospital Pharmacists.
11. Hugill, P. R. and Skolaut, M. W.: Proper Labeling of Solutions Requiring Reconstitution, *Am. J. Hosp. Pharm. 17*:339 (June) 1960.
12. Keller, C. J.: Practical Usage of Prescription Folder, *Am. J. Hosp. Pharm. 16*:28 (Jan.) 1959.
13. Lantos, R. L.: Drug Distribution is the Pharmacy's Job, *Modern Hosp. 92*:104 (Feb.) 1959.
14. Mitchener, J. W.: Labeling Responsibilities of the Hospital Pharmacist, *Bull. Amer. Soc. Hosp. Pharm. 13*:456 (Sept.-Oct.) 1956.
15. Neibel, O. J., Patient Oriented Hospital Standards, *Am. J. Hosp. Pharm. 17*:219 (Apr.) 1960.
16. Pisanelli, R.: A New Concept in Prepackaging Tablets, *Bull. Amer. Soc. Hosp. Pharm. 12*:130 (Mar.-Apr.) 1955.
17. Webb, J.: Methods of Promoting Safety and Control in Hospital Pharmacy, *Amer. J. Hosp. Pharm. 15*:976 (Nov.) 1958.
18. Whitcomb, W.: Patient Medications and Dosage Accuracy, *Am. Profess. Pharmacist 24*:316 (Apr.) 1958.
19. Wilson, C. O.: Inconsistency in Pharmaceutical Names, *Am. J. Hosp. Pharm. 16*:432 (Sept.) 1959.
20. Zugich, J. J.: Hospital Pharmacy Unanswered, *Am. Profess. Pharmacist 26*:259 (Apr.) 1960.

utilization of

THE BREWER SYSTEM

in the controlled distribution of medication within the hospital

by THOMAS A. MANZELLI

Nurse with Brewer Drug Cart leaving patient's room after having administered a drug

► THE BREWER SYSTEM, WHICH IS CURRENTLY undergoing trial in the Lankenau Hospital, has been developed by the Brewer Pharmacal Engineering Corporation of Upper Darby, Pennsylvania. From the original planning to the present state of the system, this group has pursued primarily ideas which would facilitate the working partnership of pharmacy and nursing along with development of methods which would remove the burden of accounting from these services.

In order to accomplish these ideas, the development of new equipment and forms was necessary. The Brewer System has two major pieces of equipment available—one is called the Brewer Drug Cart and the other the Brewer Drug Station. These pieces of equipment work in conjunction with each other.

Brewer Drug Cart

The Brewer Drug Cart is a mobile apparatus composed of the following:

1. A nurse's working area forms the top surface of the cart. The front half is the preparation area for the medications nurse; the back portion is arranged so that there are individual containers for storing the following: (a) Two sizes of disposable cups and their containers—one size cup for use when giving tablets and the other for pouring liquids. The latter cups have printed measuring scales on the outer surface. (b) Space for keeping large volume medications such as mineral oil, milk of magnesia, castor oil, aluminum hydroxide gel and others. (c) Alcohol well and sponges; a sterile forceps well. (d) Sterile needles. (e) Sterile syringes. (f) Used syringes and needles. (g) Waste.

2. Small individual patient drawers for storing each patient's medication separately. Each horizontal "shelf" of patient drawers consists of a multiple of seven separate drawers and it is possible to have any number of these multiples up to seven or a total of 49 drawers per cart. This flexibility allows the carts to be tailored to the number of beds at any particular nursing unit. Each drawer is labeled with the room and bed designation and has a holder for inserting the patient's name card. Each drawer has a "nesting" device so that the medication packages are stacked for easy reading of the drug labels.

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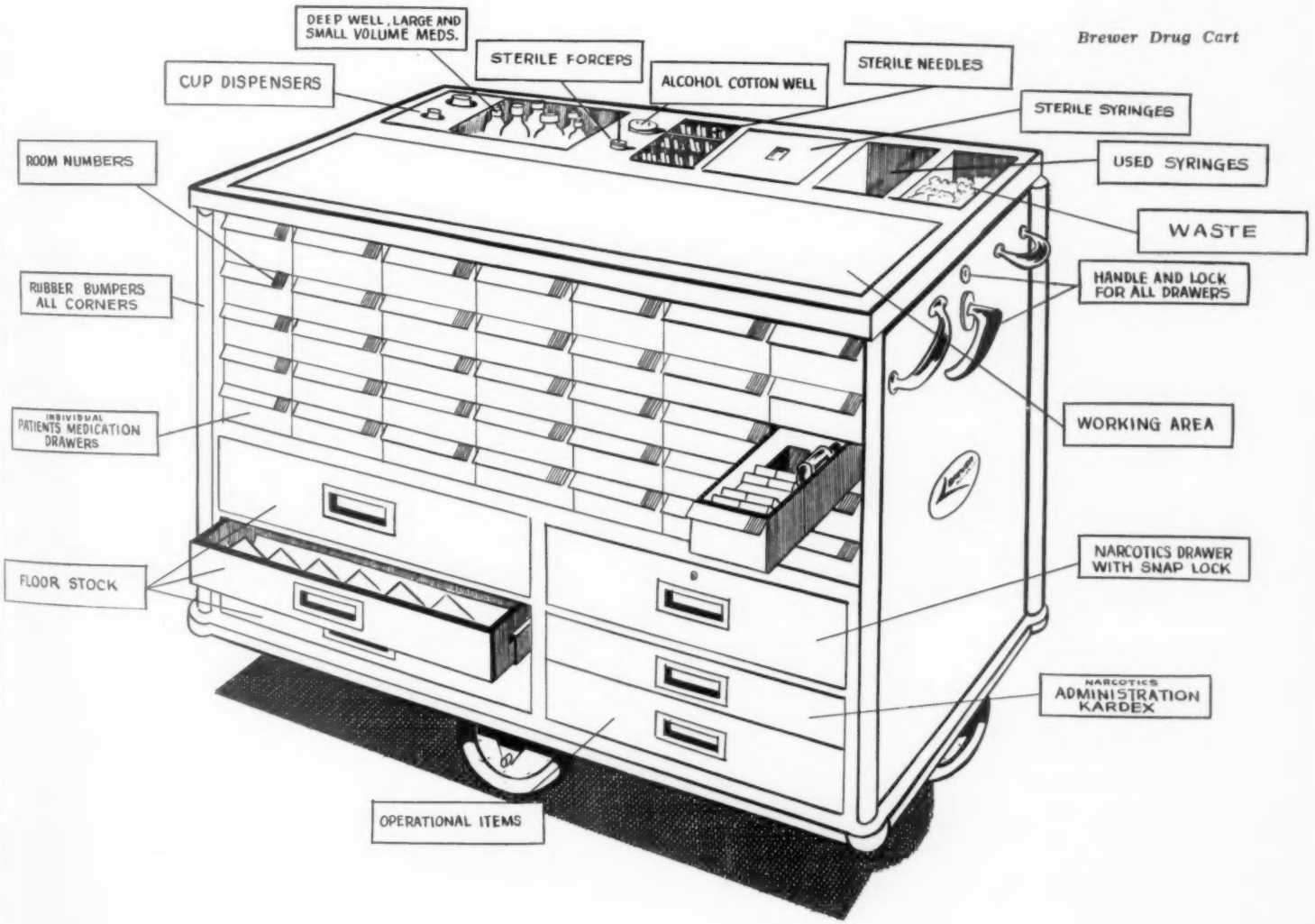
Presented to the Second Annual Seminar of the Colorado Society of Hospital Pharmacists, Denver, Colorado.

Brewer Drug Cart



3. Large drawer section which is the lower portion of the cart. This area is divided into two equal sections vertically with each section containing one seven inches high and two 3.5 inches high drawers. The three drawers on the left side are used for storing all charge and non-charge floor stock items. The seven inch drawer on the right, which has a separate lock, is used for storing narcotics; it complies fully with all regulatory requirements. The remaining two 3.5 inch drawers on the right are used interchangeably for housing the narcotics register, extra forms, pens, plastic markers for "flagging" the drawer of the individual patient who for one reason or another was absent during medication rounds, extra supplies of disposable cups, storage of items to be returned for credit and ampul files. All the drawers used for drug storage contain "nesting" liners. The medications are prelabeled and tiered so as to minimize errors due to improper identification and visibility.

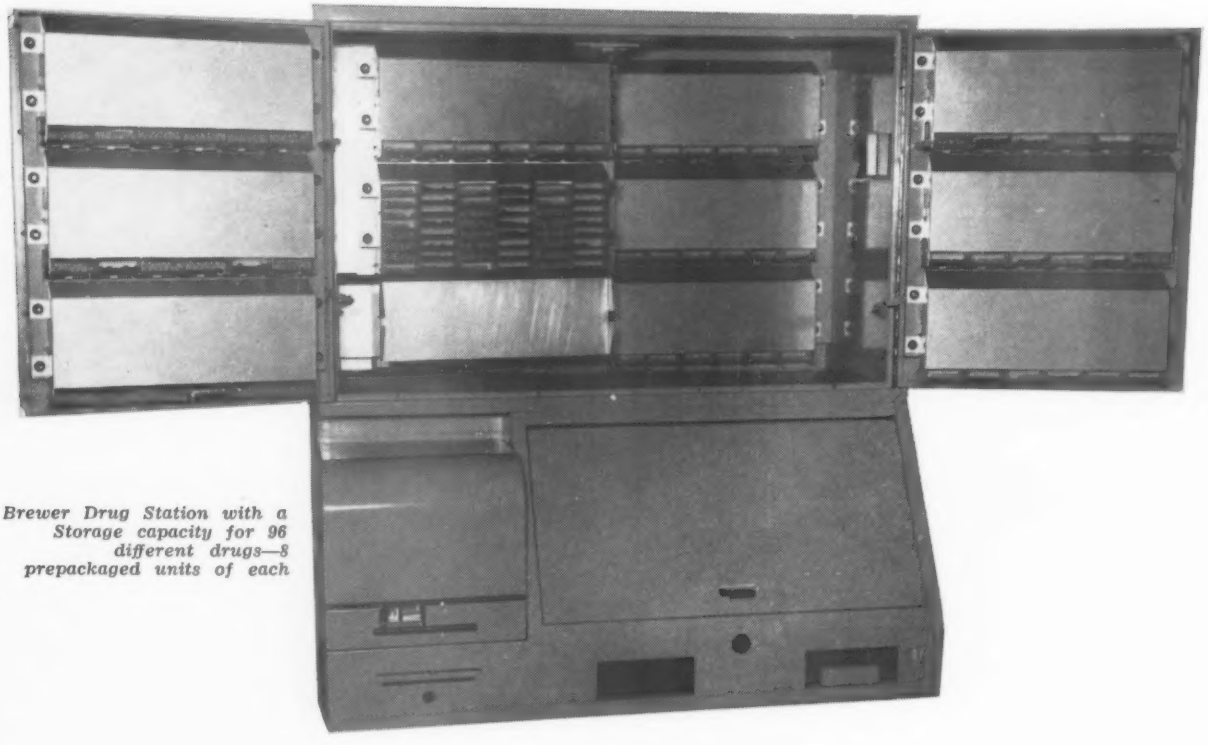
Nurse checking prepackaged Brewer Medication Box label against medication order

Brewer Drug Station

The Brewer Drug Station is an electronically controlled device which can only be operated after the three identification plates are inserted in the plate shuttle and an authorized nurse pushes the activator button. The device has been constructed so as to make it practically burglar-proof. Operation of the device is simple, for it has been engineered to do the following:

1. Store eight packages of each of 96 different medications in the standard units. By the addition of more "bin units" it is possible to store several hundred drugs in one machine. Variants as to the number of packages stored and the number of medications offered are available.

2. Deliver any medication stored in the drug station by use of the patient's addressograph plate in combination with a smaller special drug addressograph plate, and an additional nurse's identification plate. The name of the drug, the dosage, the number of tablets or ampuls packaged, and the cost and retail prices are imprinted on this special drug plate.



Brewer Drug Station with a Storage capacity for 96 different drugs—8 prepackaged units of each

3. Produce a gummed label and a charge ticket each time a transaction is made which has recorded on it the patient addressograph plate, the drug addressograph plate data, and the nurse's identification plate data. The nurse affixes this label to the delivered package of medication.

4. Record on a tape locked in the Drug Station all the data on the two addressograph plates.

The size of the drug station is such that it can be hung on a wall or rested on a base unit. These base units are designed to meet varying requirements. Units of drawers and/or shelves are available for storing charge floor stock or large volume treatment supplies. Another type of base cabinet contains a small refrigerator and another a sink. In short, units are available that, in conjunction with the Drug Station all drugs, treatments and supplies are housed and refrigeration and water provided for the nursing unit.

Procedure

An outline of the procedure one follows in the use of the Brewer System is necessary before a discussion of its effect on the pharmacy, nursing service, and accounting office can be made.

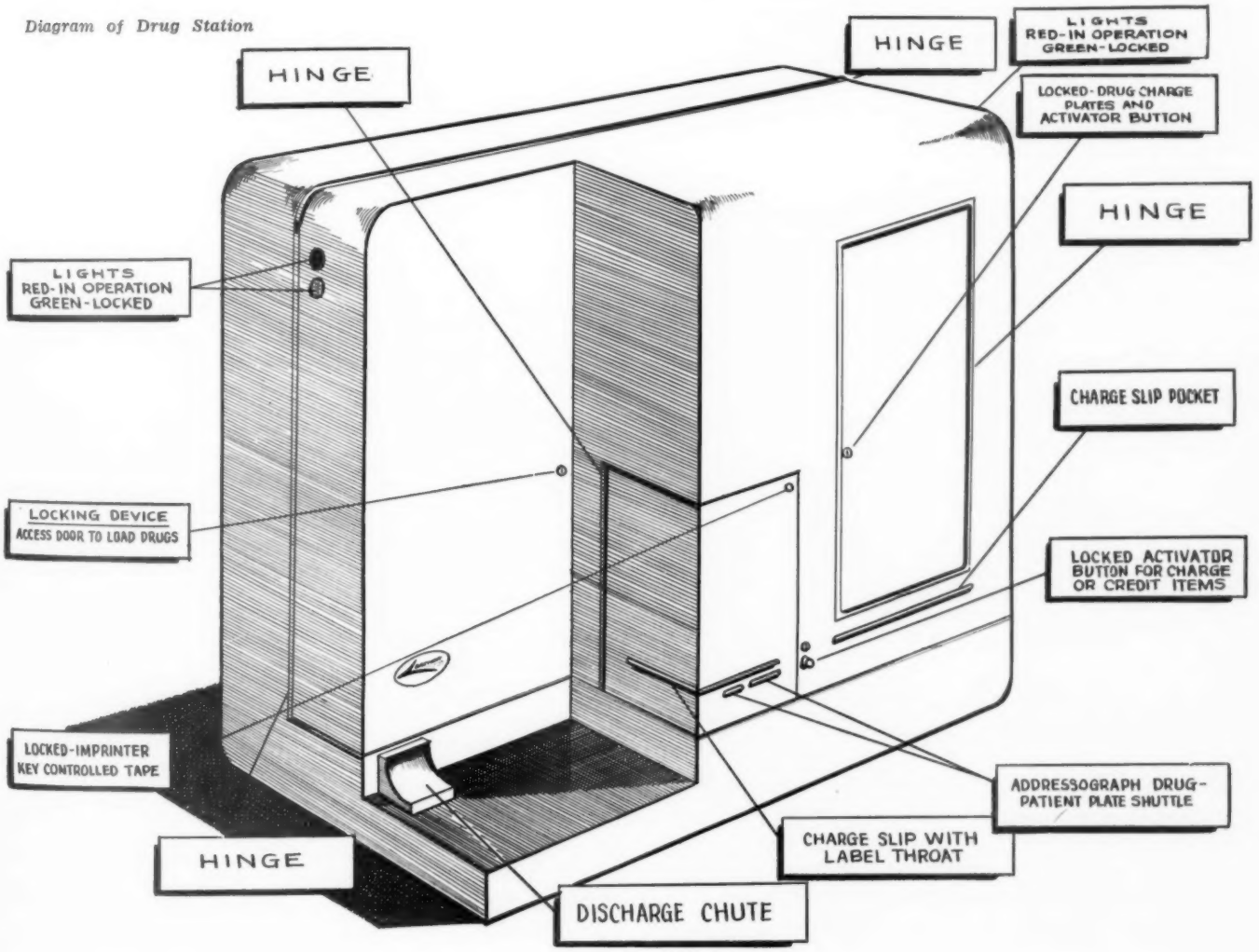
A duplicate addressograph plate is made at the time of the patient's admission; it is stored in the patient's individual medication drawer. The drug addressograph plates are prepared with the same equipment that produces the patient's plate. The drug plates are housed in a special drug plate holder in the Drug Station.

Two Kardex files are maintained—one for recording treatments, nursing care, and diets, and another for the routine and p.r.n. medications. These are kept at the nursing unit desk when not in use with the Drug or Treatment Cart. The procedure for the recording of treatments, nursing care, and diets is basically similar to that for recording routine medications and will not be discussed.

Shortly after the arrival of the patient to the nursing unit or after the physician has written his orders, the nurse prepares a "routine medication form." Instructions for the use of the medications administration record form are printed on the back of the attached sample form. The form is then inserted in the routine medication Kardex file under the corresponding room or bed designation.

To obtain medication the nurse takes the patient's addressograph plate and inserts it in the magnetized plate shuttle of the charge recorder, using her key. She

Diagram of Drug Station



then unlocks the door to the drug plate holders. The drug plates are arranged alphabetically in slots with an identifying label above each one of the slots. The nurse removes the drug plate desired and places it next to the patient's plate in the shuttle provided for this purpose. She then inserts her own identification plate next to the patient and drug plates. The Drug Station is now ready to be used. (The Station cannot be activated without all three plates being in position in the shuttle.) She inserts a snap-out form consisting of the label and the charge ticket above the plates in the shuttle and presses the activator button.

The machine automatically delivers the medication requested and simultaneously prints the data from the three addressograph plates on the label, the charge ticket, and the locked-in recording tape. The nurse snaps off the label from the form, drops the charge ticket into a slot receptacle in the drug station, affixes the label to the package and places it in the patient's drawer.

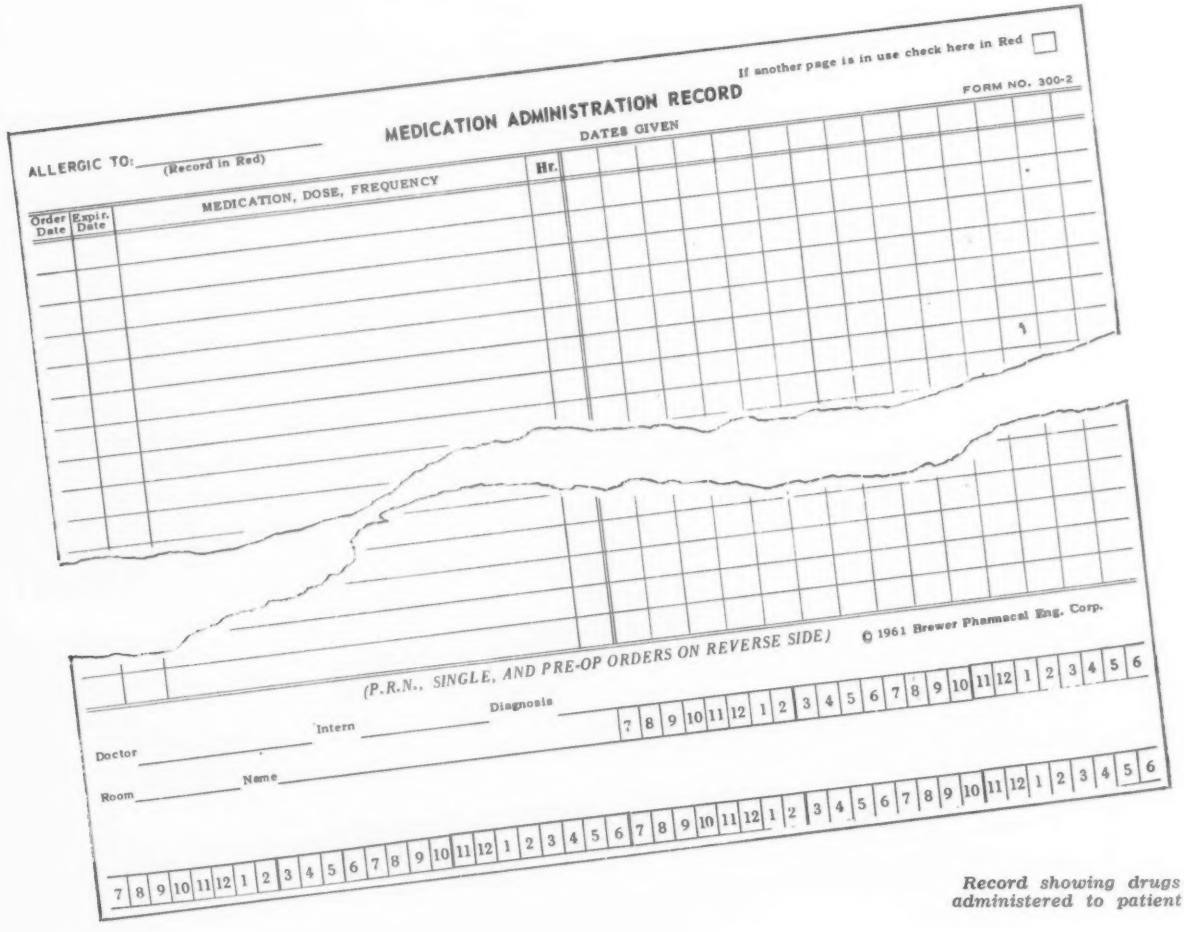
Certain unique features assure operational safety of the drug station. If more than one drug plate is removed from the Drug Station panel or if there is a break in the procedure of inserting the two plates in the imprinter, the machine ceases operation, and an alarm buzzer is sounded and continues until the error is rectified.

When the hour for the giving of medication arrives, the assigned nurse consults the routine medication Kardex file, notes the check marks on the clock under the appropriate hour and goes to the first patient's room to give the medication. She consults the routine medication form for the drug to be given at this particular hour, and opens the patient's individual drawer, checks the name of the medication again, checks the patient's wrist band to verify that he is the right patient and then gives him the medication.

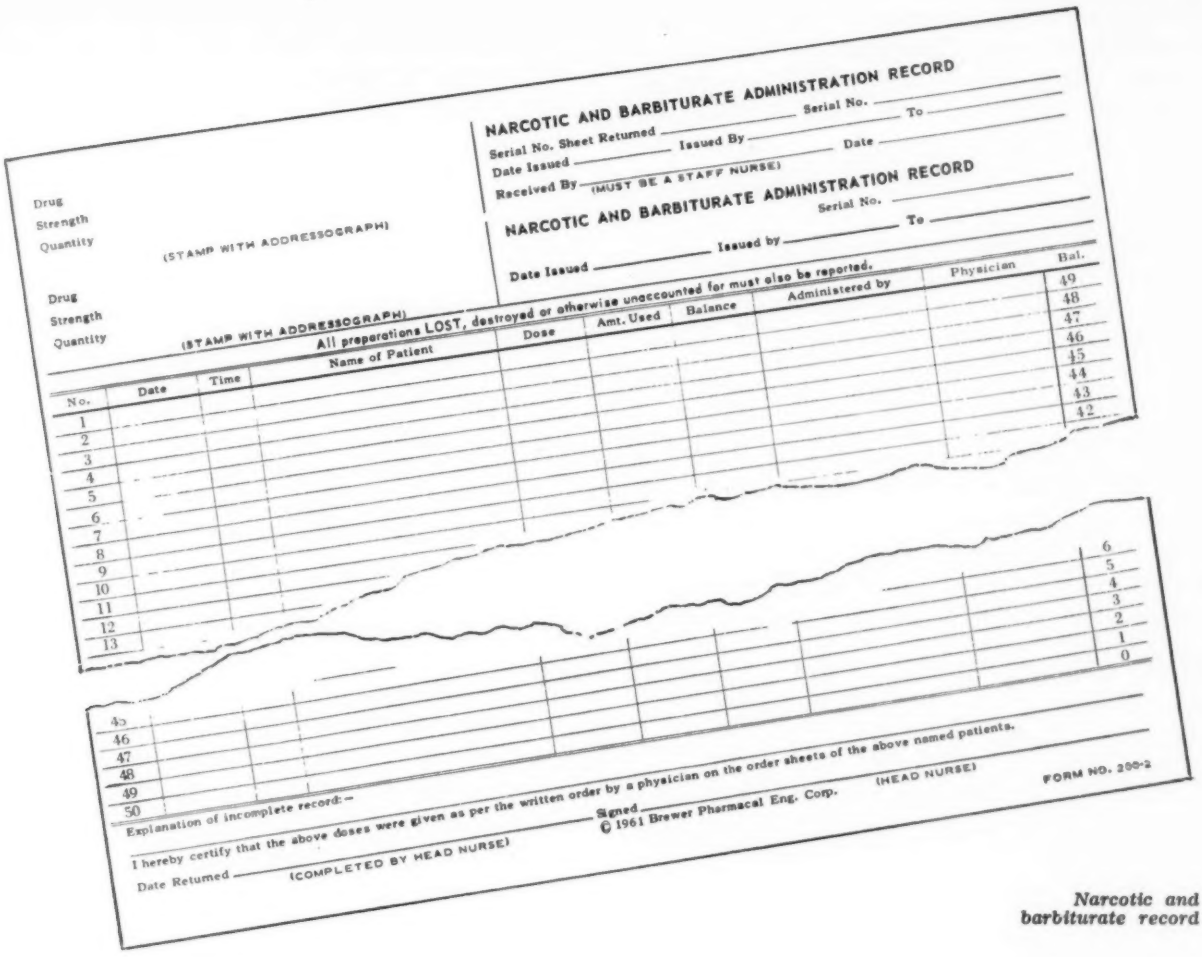
After the medication is given, the nurse initials this transaction in the space allotted. In the case of injectable medication the nurse prepares the syringe at the bedside of the patient.

The Lankenau Hospital Pharmacy has removed all charge floor stock medications. Henceforth all floor stock medications in the cart are non-charge and all charge ones are stored in the Drug Station. However, procedures for recording charge floor stock medications housed in the Drug Cart and the obtaining of medications not stored in the Drug Cart or Drug Station or when the patient's addressograph plate is not available have been worked out.

When narcotics or dangerous drugs are ordered by the physician, the nurse in charge relinquishes the narcotics key to the nurse who is to give the medication. The latter gives the patient the medication and


If another page is in use check here in Red
MEDICATION ADMINISTRATION RECORD
FORM NO. 300-2
ALLERGIC TO: (Record in Red)
DATES GIVEN
Order Date
Expir. Date
MEDICATION, DOSE, FREQUENCY
Hr.
(P.R.N., SINGLE, AND PRE-OP ORDERS ON REVERSE SIDE)
© 1961 Brewer Pharmacal Eng. Corp.
Doctor
Intern
Diagnosis
Room
Name
7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6
7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6

Record showing drugs administered to patient


NARCOTIC AND BARBITURATE ADMINISTRATION RECORD

Serial No. Sheet Returned _____ Serial No. _____

Date Issued _____ Issued By _____ To _____

Received By _____ (MUST BE A STAFF NURSE) Date _____

Drug
Strength
Quantity
(STAMP WITH ADDRESSOGRAPH)

NARCOTIC AND BARBITURATE ADMINISTRATION RECORD

Serial No. _____

Date Issued _____ Issued by _____ To _____

Drug
Strength
Quantity
(STAMP WITH ADDRESSOGRAPH)

All preparations LOST, destroyed or otherwise unaccounted for must also be reported.

No.	Date	Time	Name of Patient	Dose	Amt. Used	Balance	Administered by	Physician	Bal.
1									49
2									48
3									47
4									46
5									45
6									44
7									43
8									42
9									
10									
11									
12									
13									6
									5
									4
									3
									2
									1
									0
45									
46									
47									
48									
49									
50									

Explanation of incomplete record: —

I hereby certify that the above doses were given as per the written order by a physician on the order sheets of the above named patients.

Signed _____ (HEAD NURSE)

Date Returned _____ (COMPLETED BY HEAD NURSE)

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FORM NO. 200-2

Narcotic and barbiturate record

then records the necessary data on the card for the particular drug in the narcotics Kardex file.

Advantages to Pharmacy

Although the system has been presented here only in broad outline with little operational detail, the advantages it offers to the pharmacy and nursing services seem obvious, and will be discussed separately with our analysis to date under each of the three service areas of the hospital affected—Pharmacy Service, Nursing Service and Administration.

First, maximum controls over the drugs on each nursing unit are maintained. There is standardization of medications as to quantity dispensed and packaging. A base inventory is provided which facilitates rapid checking of unused drugs. The pharmacist, because he services each unit, is able to maintain excellent control by checking on a day to day basis the consumption rate of each medication.

Second, there is a reduction in work load of the pharmacy service. The number of charge slips handled daily is reduced to a minimum. There is a reduction in the routine individual dispensing of drugs to the floors. Less time is spent in the pricing and labeling of drugs dispensed. Time spent by the pharmacist in replenishing nursing station supplies is lessened. For example, there has been a reduction from 15 minutes per nursing unit to 5 minutes—a total daily saving of 100 minutes per day on the basis of the ten nursing units serviced in this study.

A detailed analysis of a week's experience (3/13 to 3/19 inclus.) revealed that 84.8 percent of the charge slips for the pharmacy are handled through the Brewer Drug Station. The breakdown is as follows:

Total charge slips handled	1562
Charges for I. V. and Med. Sci. & Med. Supplies	296
Charges other than I. V. and Med Sci.	1266
Charges unable to stock in Brewer Drug Station	193
Tube charges now in simulated Brewer Drug Station or could be currently stocked	175
Charges currently handled from Brewer Drug Station	898
Total charges which should be handled through Brewer Drug Station	1073
Total charges excluding Med. Sci., I. V., and Med. Supplies	1266
Percent which can be handled through Brewer Drug Station	84.8%

Another advantage is that inventory is reduced in the pharmacy and placed on the floors where it is needed. Bookkeeping is reduced. There is proper handling of narcotics and dangerous drugs.

Proper charges for all medications given to the patient are insured. In 1956, statistical analysis of

the test floor (two nursing units) showed a loss of $61.75 per day under an inadequate charge floor stock system of inventory control. A detailed survey of charge losses under a simulated Brewer Drug Station system was made from January 24, 1961 through March 17, 1961—a total of 53 days. The total charge loss for the nursing units for this 53 days period totaled $439.40 or approximately $8.30 per day or $0.83 per nursing unit per day. A comparable period in 1960 averaged about $21.00 per day per nursing unit or $210 per day loss. The total charge loss was approximately $11,130 for a total difference of $10,690 from 1960 to 1961.

Nursing Service Benefits

Several time-saving features result from use of this system. By use of the new routine medication and treatment forms the need for the small medication forms and the filling out of charge slips is eliminated. This reduces the number of recordings and transpositions of data from four to two.

The loss of nursing time for delivery of drugs is significantly reduced. Practically all medications are stored or easily available on all the nursing units, and no time is wasted waiting for drugs to be sent through pneumatic tubes or delivered by courier.

There is reduction of time spent selecting and pouring each patient's medication from the drug closet and placing it on the medications cart. The constant reshuffling and rearrangement of the medications cards each time medication rounds are made are eliminated. The use of disposable cups instead of medication glasses eliminates the time spent washing the latter. At the Lankenau Hospital approximately 15 minutes are spent washing medication glasses after a major medication round, such as at 9 A.M. is completed. These 15 minutes, multiplied by the eleven nursing stations in the hospital, represent 165 minutes or 2¾ hours for nursing time spent doing this unnecessary chore.

The pharmacy service maintains an adequate inventory of drugs on each floor, thus the nurse does not need to spend any time checking her supply of medications. Increased efficiency in the preparation of injectable medications is a result of the ready availability, on the Drug Cart, of all the facilities the nurse needs.

The conclusion derived from a survey of the nurses using the Drug Cart as to its time saving features was as follows: A medication round that formerly required about 30 minutes to complete was finished in about 30 percent less time; ones that required 45 minutes and 60 minutes previously had time savings of 40 percent and 51 percent respectively.

Several factors tend to reduce medication errors.

As opposed to the types of carts currently in use in hospitals, this cart reduces to a minimum the chance one patient will receive medication intended for another, for each patient's medications are placed in his individually assigned drawer. There is clear and easy identification of the individual patient's drawer.

Each label is machine printed; this insures easy legibility and reduction of errors due to poor handwriting. On each label is printed the name of the patient, the identification of the nurse, and the name and strength of the drug which was used. Since each package of medication is clearly prelabeled, easy comparison is made.

The nurse is able to check quickly and accurately each patient's medications against those listed in the Kardex file because of the centralization of his drugs. The preparation and pouring of the medications for each patient individually makes for more accurate checking and re-checking. The nurse can select and pour medications with greater concentration away from the distractions and inconveniences of the usually crowded nursing station. By reducing the number of recordings and transpositions from four to two, the element of human error is reduced by at least half.

Better visualization of floor stocks because of the tiering and labeling reduces medication errors both in the choosing of the proper drug and in returning it to its assigned place. Nurses working with the Drug Cart during the field trial were unanimous in their opinion that the Drug Cart gives nursing service a tool for reducing medication errors.

Administrative Advantages

The advantages from an administrative point of view may be summarized as follows. Charges for all medications given are insured. There are fewer late charges. Machine recording on charge tickets of the data needed for any accounting system assures easier and more accurate sorting and posting of the individual charges. The Drug Station tape furnishes a listing of all charges, the addition of which establishes a control total. Thus the possibility of charges not being posted is eliminated.

The Brewer System provides additional benefits of a more general nature. It places the medications where they are needed on a 24-hour basis. The system, as presently envisioned, can be used in all hospitals regardless of size and can be so adapted that, in conjunction with and under the supervision of pharmacists, part-time or retail, all hospitals can develop a high caliber pharmacy service.

The system, as outlined, is the product of much thought and work, and it appears to have great promise for the immediate future. It is a possibly radical but certainly fresh approach toward promotion of cooperation between the pharmacy and nursing services for their mutual benefit, that of the hospital and, most important, that of the patient.

PROSPECTS FOR AUTOMATION in handling physicians' medication orders

►AN AUTOMATIC ELECTRONIC DEVICE for indicating physicians' orders to nurses may completely revolutionize traditional methods of transmitting medication orders, and even the dispensing of drugs in hospitals. The proposed system named Hospital Indicator for Physician Orders (HIPO), is being developed by Mark S. Blumberg, M.D., senior health economist at the Stanford Research Institute, California. These studies, and related ones,[1] are being carried out by Dr. Blumberg under grants from the U. S. Public Health Service and the California Hospital Association.

One phase of Dr. Blumberg's study is on medication orders and doses on several wards in one-medium sized, short-term hospital. A sample of patients was chosen who were inpatients on any one of seven days selected at eight-day intervals over a two-month period. Separate samples were drawn of patients on an adult medical surgical floor, obstetrical unit, and a pediatric ward. The medication work load on sample days was determined after a review of records of the number and type of medication ordered and given. In all, 350 patient-days were examined.

Analysis of the number and types of physician medication orders written are shown in Table 1 below.

This article has been prepared from information furnished by Dr. Mark S. Blumberg. Based largely on "Economic Feasibility of Automating Selected Hospital Activities," March 13, 1961. Final Progress Report on research conducted May 1959-November 1960 with Public Health Service (Grant W-111) and California Hospital Association Support. 20 pp. mineographed.

1. Blumberg, M. S.: Hospital Automation: The Needs and the Prospects, *Hospitals* 35:34 (Aug. 1) 1961.

Table 1. Physician Medication Orders Written Per 100 Patient Days

Type of Order	Adult Medical-Surgical[1]	Obstetric[2]	Pediatric[3]
MEDICATION			
Order written, no stop	68.4	143.1	37.5
Order written, stop written	22.8	49.7	7.8
Stat order or 1-time (pre-op)	36.8	82.0	43.8
Stop only written	8.8	4.8	7.8
Total	136.8	279.6	96.9

1. Based on 136 patient days.
2. Floor, labor and delivery rooms, based on 167 patient days.
3. Based on 64 patient days.

Source: SRI.

Fig. 1. Percent of Drug Orders By Number of Drugs

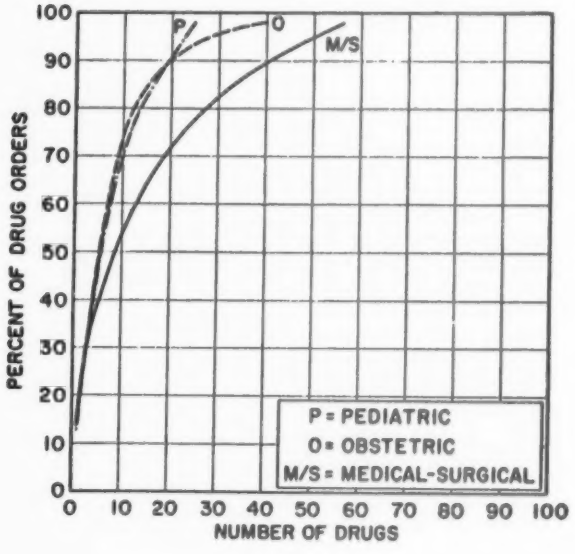
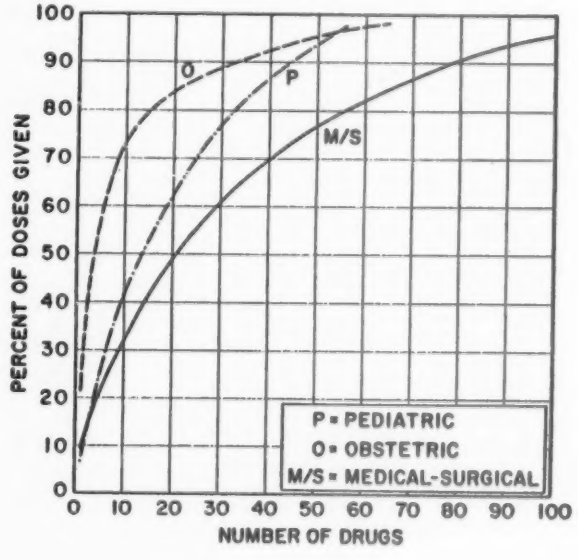


Fig. 2. Percent of Doses Given By Number of Drugs



Studies were done in one hospital on the time of day that medications were given in several wards. The uneven distribution of this work load may be clearly seen in Figures 3, 4, and 5. The figures further indicate quantitative differences between mandatory doses and p.r.n.'s which involve some nurse discretion.

Preliminary Consideration of an Electronic System to Process Medication Records

Studies indicated that clerical procedures currently used to ensure the performance of physicians' orders for patients, particularly medication orders, are expensive. Work in other phases suggested that such procedures might be facilitated by an electronic data processing system. Consequently, the specifications for such a system were considered.

Dr. Blumberg's analysis of studies indicated than on a medical-surgical ward, physicians wrote 3 orders per patient per day and over 5 for obstetric patients. About half of these orders were for medications. Every order written by a physician initiates action by others on the hospital staff. The nursing staff has to administer over 4 doses per patient per day on a medical-surgical ward and over 7 to obstetric patients. Benefits of recent rapid advances in medicine can be achieved only if physicians' orders for patient care are properly carried out. In the past 30 years, procedures used in hospitals to ensure that physicians' orders for patients are correctly executed by the nursing staff have changed very little, according to Dr. Blumberg. Most hospitals still use a cumbersome system which involves repetitive checks by several individuals. These procedures were devised in an era when labor resources for the hospital were relatively abundant and stable, the variety of drugs used was small, and the great portion of nursing care was carried out by professional employees. The occurrence of medication errors with present procedures is widely recognized.

As part of the proposed HIPO system, a prototype of a device was developed by SRI engineering staff which can match a coded card with a coded patient wrist identification tag. This portable battery-operated device indicates by a green light when the identity number on a card is the same as the identity number on a patient bracelet. The procedure is fail-safe insofar as blank cards or power failure will not permit a green (match) signal.

Basis of the HIPO System

The basis of the present system is the medicine card. One card is prepared for each medicine given to a patient. Research indicates that each patient has 2 to 4 such cards which must be handsorted at the nursing

station almost continually throughout the day. In addition, nurses must manually prepare pharmacy requisitions, charge slips for stock drugs, nurses' notes on medications given, a Kardex record of medication orders, and a special log of narcotics administered. Hospital pharmacists spend additional time preparing labels for prescriptions in which data are repeated.

In view of this, the operation of an automatic electronic system to take over these and related tasks has been conceived and studied. (See Figure 6.) Each hospital would have a centrally located electronic device with a small staff responsible for placing pertinent data of the following types in the system: (1) patient characteristics including working diagnosis, age, hospital location, and other relevant attributes; (2) doctors' orders for medication; and (3) standing orders and constraints in the use of drugs.

According to Dr. Blumberg, the HIPO system would accomplish the following:

1. It would provide a method for physicians to record their hospital orders for patient care by some means other than longhand. Physicians' handwriting is notoriously bad and it appears possible to use other techniques such as a check list for more accuracy and uniform terminology. One possible format for such a record is shown in Figure 7. Studies show that a list of only the 40 most-ordered drugs could include 90 percent of medication orders written by physicians on a given medical-surgical floor. (See Figure 1.)

2. It would automatically review physician orders for a given patient in respect to prior orders and official standing orders. In most hospitals, numerous standing or automatic orders are in force at a given time. Although these orders almost always originate from a physician or group of physicians, the means for disseminating them and ensuring their accomplishment is generally very irregular and subject to error. For example, some of these orders may be placed on the bulletin board at the nursing station; others are in standard manuals which are not always up to date or consulted; others may be transmitted by a tag or other nonverbal markings on the patient's chart.

One key service which nurses are supposed to provide the physician is a review of his orders, particularly for medications, in terms of their consistency with other orders and the patient's condition. This is all but impossible for nurses at present because of the variety of drugs available and the rapid changes in their nomenclature and popularity. Most hospitals have expert committees of physicians who are in a position to evolve standards for new drugs and their use in hospitals, but the present system does not readily permit each new order for a drug to be checked against these standards.

3. It would print an individualized work order at the proper time for nurses which gave the patient's

Fig. 3. Number of Doses By Hour of Day. Adult Medical

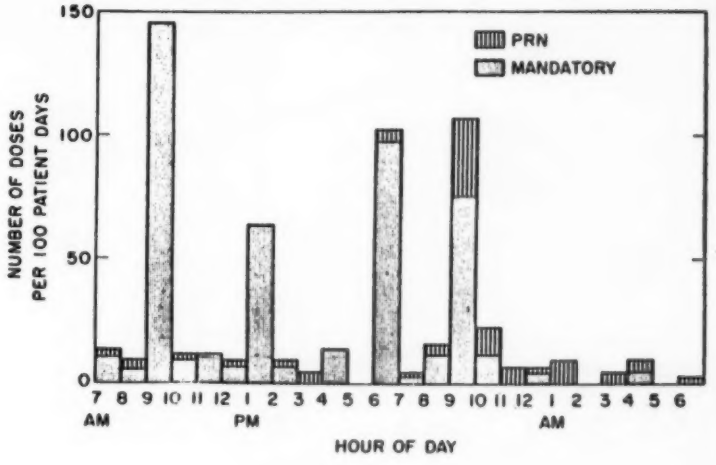


Fig. 4. Number of Doses by Hour of Day. Adult Surgical

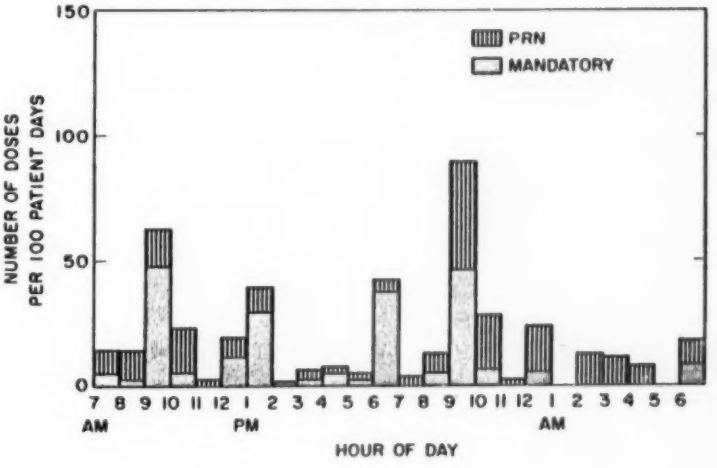


Fig. 5. Number of Doses by Hour of Day. Pediatrics

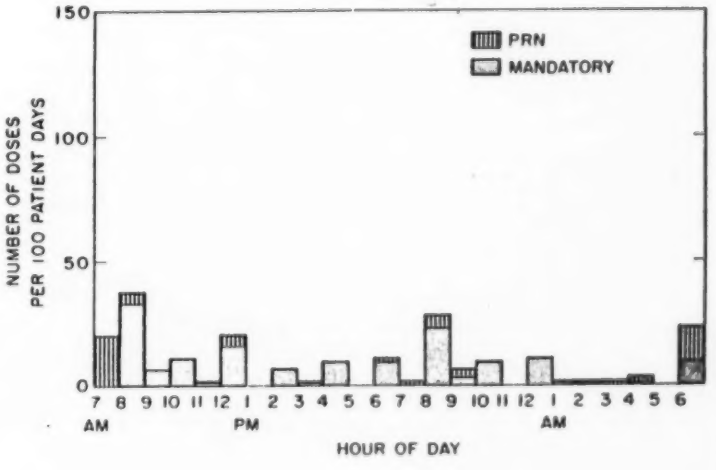


Fig. 6. Hospital Indicator for Physician Orders

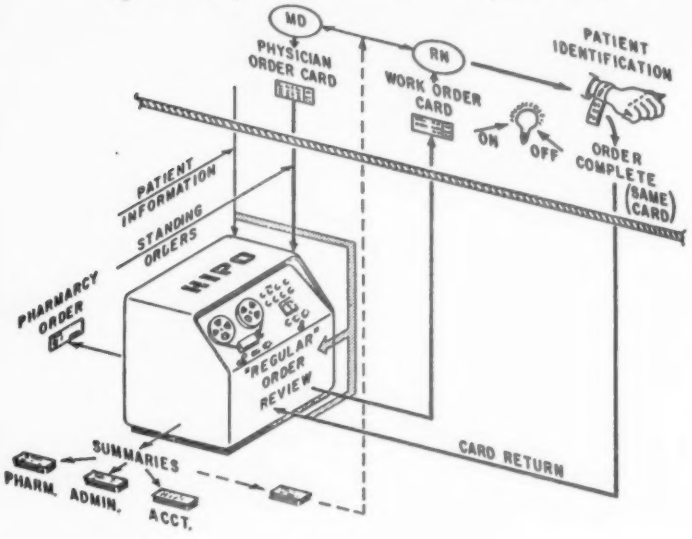


Fig. 7. Physician Order Card

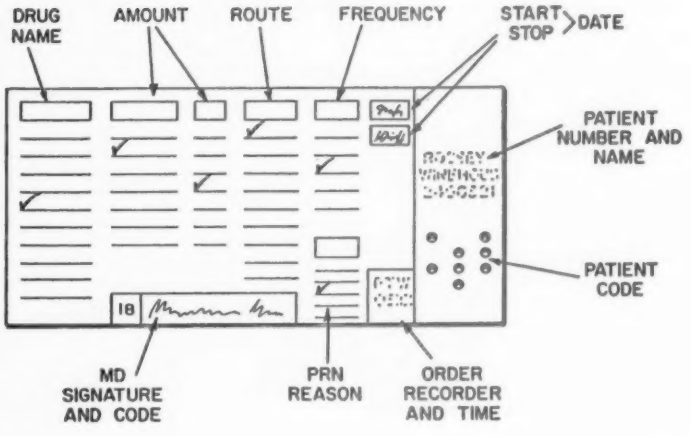
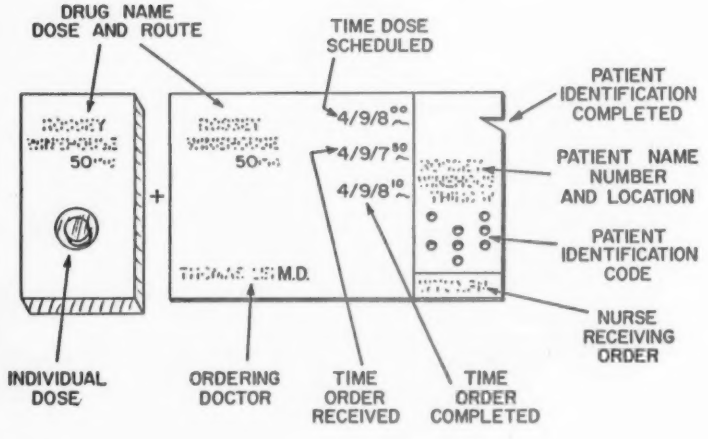


Fig. 8. Work Order Card



name, the medication, dose, route, and time and date due. An illustrative example of such a work order card is shown in Figure 8. A continuous signal would indicate unfilled work orders. Use may be made of an automatic dispenser to provide the nurse with suitably labeled single doses of medication at appropriate times. Despite the diversity of drugs in use, studies indicate that a dispenser with only 40 different drugs could provide for three-fourths of the doses given on a medical-surgical ward. (See Figure 2.)

4. It would be used with a portable device to compare a patient's identification tag with the name on the nurse's medication work order. The device could even record whether or not a nurse bothered to positively identify the patient by use of the device.

5. It would control drug inventory at the nurses' station to ensure that sufficient medications and related supplies are available to carry out obligations. This procedure would be related to the medication dispenser.

Virtually all drugs on the ward would be stock drugs which would reduce the wastage inherent in having individual prescriptions for each patient.

6. It would provide records and summaries of clinical and administrative value. For example, physicians could be given cumulative dose data on patients, a list of orders which require renewal, and a more accurate chronologic list of what medications and procedures were performed on his patients. The nurse could have a better chance to plan for her work load. Narcotics records which are now so laboriously kept by nurses would be included in the over-all record system. Patients could also be billed automatically for medications on a basis of amounts consumed rather than ordered. The administrator could have useful statistics on the number and type of medications and other services being given at various locales and to different types of patients. Even the midnight census could be prepared automatically and related census data could be continually available.

7. It may also be feasible to extend the HIPO system to record and indicate other physicians' orders such as those for diets, X-rays, operations, and laboratory procedures in addition to those for medications.

These are some of the things which appear possible from Dr. Blumberg's basic studies on the feasibility of utilizing electronic computer devices to the handling of physicians' medication orders. The emphasis thus far in Dr. Blumberg's research has been to explore the economic feasibility of using computer devices to automate selected hospital activities. While no equipment has been built thus far, his studies show that several general purpose computers could be utilized if suitable procedures can be devised for the input and output of information. Dr. Blumberg has recently been awarded an additional grant from the U. S. Public Health Service for continuation of his studies.

Therapeutic Trends

edited by WILLIAM JOHNSON, *Bronson Methodist Hospital, Kalamazoo, Michigan*

Fluphenazine In Private Psychiatric Practice

Fluphenazine (a trifluoromethyl hydroxyethyl piperazine propyl derivative of phenothiazine) is one of the most potent of the phenothiazines. It has rapid and sustained tranquilizing actions and other pharmacological properties characteristic of this group of compounds. Laura Morrow treated 174 patients in this study and reported the results in *Am. J. Psychiat. 117*:1031 (May) 1961. Patients presented such conditions as confusion, delusions, hallucinations, ideas of reference and also anxiety, tension and depression. Most had received previous psychiatric therapy, some had had electroshock, and some had had tranquilizing drugs. Fluphenazine was administered either intramuscularly or orally. The usual dose ranged from 0.5 mg. to 2.5 mg. once or twice daily. Treatment lasted from one to 24 weeks, the majority being at least 2 months. Of the 167 patients evaluated, 70 percent showed a satisfactory response with complete or almost complete disappearance of the symptoms for which they had presented themselves for treatment. The drug proved to be especially helpful in facilitating psychotherapy. Some side effects were noted and in most cases could be controlled by reduction of dose or addition of methanesulfonate. Fourteen of the patients had to be discontinued because of untoward side effects.

RICHARD H. HARRISON

Antihypertensive Benzothiadiazine Derivatives Devoid Of Diuretic Activity

Rubin *et al.* report the synthesis of compounds of the 1,2,4-benzothiadiazine-1,1-dioxide series in *Science 133*:2067 (June 30) 1961. The first compound of this series, 7-chloro-3-methyl-1,2,4-benzothiadiazine-1,1-dioxide (Compound I) when administered experimentally to renal hypertensive dogs in oral doses of 5 mg./Kg. per day caused a gradual fall in blood pressure without evidence of diuresis. Upon withdrawal of the drug, the blood pressure returned to approximately pretreatment levels in 3 to 6 days. Chemically, Compound I differs importantly from the diuretic 1,2,4 benzothiadiazine-1,1-dioxides in being devoid of the benzenoid sulfamyl group. Further experiments have indicated that other compounds of this type and other classes of compounds which differ from known diuretic sulfonamides in that the sulfamyl group is replaced by hydrogen, alkyl, halogen, trifluoromethyl, or the like, demonstrate a similar antihypertensive activity separate from diuretic action. An extensive series of these compounds are being synthesized and biologically evaluated.

WILLIAM E. JOHNSON

A New Corticosteroid, Fluprednisolone

A new corticosteroid, 6-*alpha*-fluro-prednisolone (fluprednisolone), has been administered to 72 patients with a variety of illnesses for which corticoids were felt to be indicated. Fluprednisolone has proved to be a potent anti-inflammatory and anti-allergic steroid. Hyperglycemic-eosinopenic assay in man has shown fluprednisolone to be approximately 10 times more potent than hydrocortisone, or 2.5 times more potent than prednisolone on a milligram basis. Side effects have been minimal, and generally those characteristic of the newer prednisteroids. Although the results of the preliminary study have been encouraging, McMahon and Gordon reporting in the *Wisconsin Med. J. 60*:291 (May) 1961 believe that further experience with this drug will be necessary before any definite conclusions can be formed as to its therapeutic advantages. The fluprednisolone was supplied by the Upjohn Company as Alphadrol.

SYLVIA SCHMIDT

Ice Water As Treatment Of Burns

In each of 100 cases, pain was immediately relieved and the extent of redness and blistering was visibly reduced when patients with burns of all degrees involving less than 20 percent of the body surface were treated with immersion in baths of ice water or by applying ice-cold compresses as promptly as possible. Shulman reports in *J. Am. Med. Assoc. 173*:1916 (Aug. 25) 1960, that this treatment evidently suppresses the pathological chain of events that follows a burn. Local cooling was continued for several hours, until pain no longer returned when the part was taken out of the bath. No infections were reported in patients treated within one hour after the burn.

KENNETH W. HUCKENDUBLER

Timely Drugs

Akineton

GENERIC AND CHEMICAL NAMES: Biperiden; 1-bicycloheptenyl-1-phenyl-3-piperidino-propanol-1.

INDICATIONS: An anticholinergic agent with weak visceral atropine-like effect and strong nicotinolytic activity. Indicated in Parkinson's disease, drug-induced extrapyramidal disturbances, and in spastic disorders not related to parkinsonism (multiple sclerosis, spinal cord injury, cerebral palsy).

SIDE EFFECTS: Primarily dry mouth and blurred vision; others include mild gastric disturbances, decreased urinary flow. Absentmindedness, confusion and delusions are rare.

PRECAUTIONS: Caution should be observed in patients with glaucoma and epilepsy.

DOSAGE: For Parkinson's disease: 1 tablet (2 mg.) orally three to four times a day. For drug-induced extrapyramidal disorders: 1 tablet (2 mg.) orally one to three times a day; or 2 mg. intramuscularly repeated every half hour until resolution of the symptoms is effected and not more than 8 mg. in 24 hours. For other disorders of the extrapyramidal symptoms (choreas, spasmodic torticollis, etc.): ½ to 1 tablet (1 to 2 mg.) three to four times a day; or 5 mg. intravenously given very slowly and may be repeated once in 24 hours. This drug can be administered in conjunction with all agents employed in the treatment of parkinsonism, including atropine and antihistamines.

PREPARATIONS: Aqueous solution in 1.4 percent sodium lactate solution (with no added preservative) for injection, each ml. containing 5 mg. biperiden lactate, 1 ml. ampuls;
Tablets, scored, containing 2 mg. biperiden hydrochloride.

PACKAGING: Boxes of 6 ampuls. Bottles of 100 and 1000 tablets.

MANUFACTURER: Knoll Pharmaceutical Company.

Capla

GENERIC AND CHEMICAL NAMES: Mebutamate; 2-methyl-2-sec-butyl-1,3 propanediol dicarbamate.

INDICATIONS: For control of hypertension, either alone in mild cases, or with diuretics or peripherally acting hypotensive agents in more severe cases. Structurally and pharmacologically related to meprobamate, except that it has a marked hypotensive effect.

SIDE EFFECTS: Occasional light-headedness or drowsiness.

DOSAGE: One tablet (0.3 Gm.) 3 or 4 times daily, before meals and at bedtime, or as required for the individual situation. Onset of action occurs 15 to 30 minutes after administration and the therapeutic effect lasts 4 to 6 hours.

PREPARATION: Tablets containing 0.3 Gm. mebutamate.

PACKAGING: Bottles of 100 tablets.

SUPPLIER: Wallace Laboratories.

Spartase

CHEMICAL COMPOSITION: Potassium and magnesium salts of aspartic acid.

INDICATIONS: Management of fatigue, whether or not associated with functional or organic disease. Not intended to supplant specific treatment or accompanying organic disease or to replace potassium.

SIDE EFFECTS AND CONTRAINDICATIONS: Nausea, abdominal discomfort and diarrhea are noted occasionally, but may be minimized by administration after meals. No known contraindications yet.

DOSAGE: Adult dose is two 500 mg. tablets after the morning and evening meals. Subjective clinical improvement may be noted after four days of therapy.

PREPARATION: Tablets containing 250 mg. potassium aspartate and 250 mg. magnesium aspartate.

PACKAGING: Bottles of 100 tablets.

SUPPLIER: Wyeth Laboratories.

Torecan

GENERIC AND CHEMICAL NAME: Thiethylperazine maleate; 2-ethylmercapto-10-(3'-(1"-methyl-piperazinyl-4")-propyl-1') phenothiazine dimaleate.

INDICATIONS: For prophylactic and therapeutic treatment of nausea and vomiting from various causes, such as pregnancy; labyrinthine disturbances; inflammatory and non-inflammatory conditions such as influenza, uremia, drug toxicity, alcoholism, carcinoma, hepatitis, peptic ulcer, cirrhosis, gastroenteritis, meningitis and biliary diseases; postoperative nausea and vomiting; radiation and nitrogen mustard therapy; migraine and tension headaches.

DOSAGE: Oral: Average, 1 tablet (10 mg.) 3 times daily. (Range, 2 to 6 tablets daily.) Intramuscular: Average, 10 mg. to 20 mg. daily.

SIDE EFFECTS AND CONTRAINDICATIONS: Drowsiness and/or dryness of the mouth may occur with doses above 30 mg. daily. While no hepatic, hematopoietic or renal toxicity has been reported, these reactions may occur with the phenothiazine group. Orthostatic hypotension may be manifested at higher dose levels. Contraindicated in severely depressed or comatose states from any cause. In excessive doses it may produce extrapyramidal stimulation with the varied symptom complex characteristic of this complication. Ampuls are recommended for intramuscular use only.

PREPARATIONS: Tablets, 10 mg.; and ampuls, 2 ml., 5 mg./ml. (Inactive ingredients, per ml.: sodium metabisulfite 0.25 mg., sodium bicarbonate 1.0 mg., propylene glycol 50 mg., and water for injection q.s.).

PACKAGING: Bottles of 100 tablets. Boxes of 12 and 100 ampuls.

SUPPLIER: Sandoz Pharmaceuticals.

Vi-Drape Surgical Film

COMPOSITION: Pre-sterilized plastic sheet in sealed rolls.

INDICATIONS: To isolate the patient's skin from the surgical wound and maintain an aseptic field during surgery.

PREPARATIONS: Pre-sterilized, sealed rolls of Vi-Drape Surgical Film in a regular (24" x 42") and a smaller (24" x 18") size.

PACKAGING: 12 rolls in a box.

SUPPLIER: Aeroplast Corporation.

THE LAW
and hospital pharmacy

edited by GEORGE F. ARCHAMBAULT

► *Because law is a complex specialty made so because of the existence of a set of Federal laws, 50 sets of state laws, and many county and municipal laws and regulations, the author of the column strongly recommends that when specific legal questions arise, one should always consult an attorney, competent in the local law.*

► ON APRIL 22, 1961, THE GOVERNOR OF NEW YORK STATE signed into law the following bill which is of special interest to all hospital administrators, physicians and pharmacists. Should your state hospital and hospital pharmacy associations be concerned about the legality of the formulary system as recommended by the American Hospital Association and the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS, it is strongly recommended that the respective legislative committees of these two groups be made familiar with this New York statute in connection with their studies and legislation program. It may well be that this statute lends itself to the needs of your area and might well be considered for legislative action in your state.

AN ACT

To amend the penal law, in relation to the supplying of drugs under generic or nonproprietary names by hospital pharmacies in certain cases.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. Section seventeen hundred forty-two of the penal law, as amended by chapter one hundred ninety-two of the laws of nineteen hundred forty, is hereby amended to read as follows:

1742. Omitting to label drugs, or labeling drugs wrongly. Any person who, in putting up any drug, medicine, or food or preparation used in medical practice, or making up any prescription, or filling an order for drugs, medicines, food or preparation puts any untrue label, stamp or other designation of contents upon any box, bottle or other package containing a drug, medicine, food or preparation used in medical practice, or substitutes or dispenses a different article for or in lieu of any article prescribed, ordered, or demanded; or puts up a greater or less quantity of any ingredient specified in any such prescription, order or demand than that prescribed, ordered, or demanded, or otherwise deviates from the terms of the prescription, order, or demand by substituting one drug for another, is guilty of a misdemeanor; provided, however, that, except in the case of physician's prescriptions, nothing herein contained shall be deemed or construed to prevent or impair or in any manner affect the right of an apothecary, druggist, pharmacist or other person to recommend the purchase of an article other than that ordered, required or demanded, but of a similar nature, or to sell such other article in place or in lieu of an article ordered, required or demanded, with the knowledge and consent of the purchaser. Upon a second conviction for a violation of this section the offender must be sentenced to imprisonment, for a term of not less than ten days nor more than one year, and to the payment of a fine of not less than ten dollars nor more than five hundred dollars. The third conviction of a violation of any of the provisions of this section, in addition to rendering the offender liable to the penalty prescribed by law for a misdemeanor, shall forfeit any right which he may possess under the law of this state at the time of such conviction, to engage as proprietor, agent, employee or otherwise, in the business of an apothecary, pharmacist, or druggist, or to compound, prepare or dispense prescriptions or orders for drugs, medicines or foods or preparations used in medical practice; and the offender shall be by reason of such conviction disqualified from engaging in any such business as proprietor, agent, employee or otherwise or compounding, preparing or dispensing medical prescriptions or orders for drugs, medicines, or foods or preparations used in medical practice.

The provisions of this section shall not apply to the practice of a practitioner of medicine who is not the proprietor of a store for the dispensing or retailing of drugs, medicines and poisons, or who is not in the employ of such a proprietor, and shall not prevent practitioners of medicine from supplying their patients with such articles as they may deem proper, and except as to the labeling of poisons shall not apply to the sale of medicines or poisons at wholesale when not for the use or consumption of the purchaser, provided, however, that the sale of medicines or poisons at wholesale shall continue to be subject to such regulations as from time to time may be lawfully made by the board of pharmacy or by any competent board of health.

The provisions of this section shall not apply to a hospital pharmacy which prepares a formulary containing the brand names and the generic names of drugs and of manufacturers which it stocks, provided that it furnishes a copy of such formulary to each physician on its staff and the physician

signs a statement authorizing the hospital to supply the drug under any generic or nonproprietary name listed therein and in conformity with the regulations of the commissioner of education.

This Act shall take effect immediately.

To indicate the lack of understanding that exists relative to the formulary system, there appears below, in full, the April 7, 1961, letter of the Executive Secretary of the Pharmaceutical Society of the State of New York (written 15 days prior to the passage of the Bill). Mr. Gesoalde has given permission for the publication of this letter, and states further, that the New York Society "shall be working for the repeal of the measure at the 1962 Session of the Legislature." This again points out our lack of good communications with community practitioners and their association leaders. We know that the formulary system is not "substitution" in any sense of the word. New York hospital pharmacists, like many of the rest of us, need to circulate more freely the information found in the "Statement of Guiding Principles on the Operation of the Formulary System," as it appeared in the Journal of the American Hospital Association, *Hospitals* (October 16, 1960) and in the AMERICAN JOURNAL OF HOSPITAL PHARMACY (October, 1960).

Mr. Gesoalde's letter follows:

April 7, 1961

Honorable Robert McCrate
Counsel to the Governor
Executive Chamber
State Capitol
Albany 1, New York:

RE: *S. Int. 1941 Print 2028, 2750*
Mr. Daniel G. Albert

Dear Mr. McCrate:

We have received notice of this bill being sent to the Governor, and by all indications it seems to be a "30 Day" bill. The effects of this bill are far reaching on both pharmacy and the protection of the public health, and therefore, we have taken the liberty of writing this letter so that the Governor may receive the comments and recommendations of the pharmacists of this State on this highly important bill.

The effect of this bill is to "legalize" a practice so dangerous to the public health that it almost defies description—the practice is termed *Substitution.*

This practice is illegal under federal law (the Durham-Humphrey Amendment to the Food, Drug and Cosmetic Law) and under the law of the State of New York (Article 137 of the Education Law). It is considered an "unprofessional act" by the Commissioner of Education (Regulations of the Commissioner of Education, Section 57, subdivision 6), and is universally recognized by the medical and pharmaceutical professions as an evil and dangerous usurpation of the physician's duties and responsibilities to prescribe.

The law provides that *substitution* may only be sanctioned when the pharmacist receives *specific* authorization on an *individual* prescription, and must note on that prescription the "facts of the substitution, and the date, time and manner in which the authorization for substitution was given to the pharmacist by the prescriber." (Regulations of the Commissioner of Education, Section 57, (6).)

The entire purpose and spirit of these provisions is the protection of the public health by allowing unauthorized change only in instances of impending need.

For some few years, certain hospital interests have made attempts to have these public health requirements softened, but the people and agencies charged with the responsibility of protecting the public health have clearly indicated that these important provisions must not be relaxed.

These hospital interests are not guided by physicians or pharmacists. They are a few "hospital administrators" or "directors"—businessmen—running certain hospitals, clinics, maternity homes and nursing homes. These directors have only one guiding light — the beacon of *economics.* Choice of whether a physician wishes to give the hospital the right to *substitute* is not in the physician's hands. If he wants to practice at that hospital, he must give them that privilege.

These lay directors, in their quest for economic "savings," often lose sight of the public health factors. It is these men who are prone to purchasing drugs on price alone—drugs of questionable quality—as opposed to purchasing drugs of the best quality for the patients of their institutions.

Now, through the subterfuge of placing an exemption in the Penal Law, these interests in the hospital field seek to circumvent the judgment of the health professions and their regulatory agencies by a contractual formulary. This would allow the heinous practice of *substitution* to be carried on by people who, oftimes, are not even qualified to dispense drugs in the first place.

This formulary also brings up the question of *class legislation.* Hospitals would be exempt from criminal prosecution for *substitution* (and, perhaps, even civil suit) while the retail pharmacist doing the same act would be both criminally and civilly liable. If sound argument showing how the public health would be better protected by such class legislation could be presented, we would be the first to support it. However, the only reason for this class legislation is an economic one, and this we must abhore.

To allow this bill to become law would be to sidestep the recommendations and considerations of those who can have only one guiding light—the beacon of the protection of the public health. It would be a surrepetitious surrender to the economic interests of a few hospitals—a surrender with far-reaching implications and dangers to the practice of Good Medicine, Good Pharmacy and, most important, to the Public Health.

The Pharmaceutical Society of the State of New York, therefore, respectfully requests and recommends that the Governor *veto* this bill in the interest of the Public Health.

Sincerely,
NICHOLAS S. GESOALDE,
Executive Secretary

The Pharmaceutical Society of the State of New York
Albany, New York

EDITOR'S NOTE: I am greatly indebted to Mr. Louis P. Jeffrey, pharmacist-in-chief, Albany Medical Center Hospital, Albany, New York, and to Mr. Nicholas Gesoalde, executive secretary of the Pharmaceutical Society of the State of New York, for the material in this month's column.

Second Specialized Institute on Hospital Pharmacy

CHICAGO, NOVEMBER 6 - 8

► RATIONAL DRUG THERAPY is a phrase which has been associated for some time with hospitals, their medical staffs and the practice of hospital pharmacy. According to authorities, the basis for a rational drug therapy program is the objective evaluation, selection and use of medicinal agents in the hospital.

To assist pharmacists to participate more effectively with hospital medical staffs in their efforts to achieve rational drug therapy, the Second Specialized Institute on Hospital Pharmacy will have as a central theme—"Hospital Pharmacy and Rational Drug Therapy." The Institute will be conducted by the American Hospital Association on November 6-8, 1961 at the A.H.A. Headquarters in Chicago, Illinois, in cooperation with the American Pharmaceutical Association and the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS.

The Institute is designed to provide the following daily: (a) *lecture* — dealing in theory and general principles, (b) *study groups* — providing opportunity for small group discussions, and (c) *seminar* — offering a means for summarizing the study group discussions.

The complete program will be directed by a Coordinating Chairman who will be assisted by a number of Study Group Leaders. Lectures will be presented by organized experts and will serve as the basis for each day's discussion.

Active participation by institute registrants will be required in the majority of the sessions and pre-institute reading assignments are contemplated.

Program and Faculty

Selected to serve as Coordinating Chairman is John G. Adams, Ph. D., formerly dean of Duquesne University School of Pharmacy, and currently professor of pharmacology and coordinator of pharmacological research, University of Connecticut, Storrs, Connecticut.

Serving as guest lecturers are Theodore R. Sherrod, M. D., professor of pharmacology, College of Medicine, University of Illinois, Chicago; Chauncey D. Leake, Ph. D., assistant dean and professor of pharmacology, College of Medicine, Ohio State University, Columbus; and Edmund D. Pellegrino, M. D., professor of medicine, chairman of the Department of Medicine, Medical Center, University of Kentucky, Lexington.

Study group leaders who will assist the coordinating chairman by directing the discussions and by participating in the daily seminar are: Grover C. Bowles, Baptist Memorial Hospital, Memphis, Tennessee; Edgar N. Duncan, USPHS Hospital, Chicago, Illinois; Winston J. Durant, University Hospital, University of Wisconsin, Madison, Wisconsin; Don E. Francke, University Hospital, University of Michigan, Ann Arbor, Michigan; Walter M. Frazier, Springfield City Hospital, Springfield, Ohio; Leo F. Godley, Harris Hospital, Fort Worth, Texas; F. Regis Kenna, American Hospital Association and University of Chicago Clinics, Chicago, Illinois; Clifton J. Latiolais, Ohio State University Health Center, Columbus, Ohio; Joseph A. Oddis, AMERICAN SOCIETY OF HOSPITAL PHARMACISTS and American Pharmaceutical Association, Washington, D. C.; and Paul F. Parker, University Hospital, University of Kentucky Medical Center, Lexington, Kentucky.

Three specific topics will be discussed during the three-day period, a single topic serving as the theme for each day. The three topics are: Clinical Evaluation of Drugs, Critical Analysis of Drug Literature, and Role of the Hospital Pharmacist in Rational Drug Therapy.

Registration

Early registration is recommended. A program preview including an application form for registration has been mailed to all active members of the SOCIETY. Those wishing to attend should complete the form and return it to the American Hospital Association as soon as possible. Arrangements for housing have been completed with the Lake Tower Motel, located several blocks from the A.H.A. Headquarters. Further instructions pertaining to housing will be provided by the American Hospital Association after registrants have been notified of acceptance to attend the Institute.

► THE ILLINOIS SOCIETY of Hospital Pharmacists is arranging a reception for Sunday evening, November 5, 1961, from 4:00 to 9:00 P.M., at the Lake Tower Motel. This will provide registrants an opportunity to become acquainted and to meet members of the faculty.

News

Louis P. Jeffrey

John W. Webb

1961-1962 ASHP Officers Named

Louis P. Jeffrey, director of pharmacy service at Albany Medical Center Hospital, Albany, New York, has been elected President of the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS for the 1961-1962 term. The Vice-President-Elect is John W. Webb, director of pharmacy at Massachusetts General Hospital and Massachusetts Eye and Ear Infirmary, Boston. Sister Mary Berenice, S.S.M., director of pharmacy service at the St. Mary's Group of Hospitals, St. Louis, Missouri and director of the hospital pharmacy internship program in these hospitals, has been re-elected Treasurer for a three-year term beginning with the 1961 Annual Meeting. The Secretary, who is nominated by the ASHP Executive Committee and elected by the House of Delegates, is Joseph A. Oddis who was elected to serve for a three-year term beginning with the 1960 Meeting.

The President-Elect, Louis P. Jeffrey, has served the national organization over a period of several years. He has been a member of the Executive Committee since 1958, serving the first two years as Chairman of the Committee on Membership and Organization and is currently serving as Chairman of the Committee on Resolutions. Locally, he has been active in the New York State Council of Hospital Pharmacists of which he is now serving as President and he was also President of the Northeastern New York Society of Hospital Pharmacists from 1956 to 1959. He is Editor of *The Bulletin,* official publication of the Northeastern New York Society. He has also participated in several institutes on hospital pharmacy, ASHP Annual Meetings, and meetings of the American Association for the Advancement of Science.

The Vice-President-Elect, John W. Webb, is presently serving as the Chairman of the ASHP Committee on Laws, Legislation, and Regulations. Locally, he is President of the Massachusetts Society and a Past-President of the New England Council of Hospital Pharmacists. He earlier served as President of the Connecticut Society when he held the position as chief pharmacist at Hartford Hospital in Hartford, Connecticut. He has participated in institutes and ASHP Annual Meetings and is the author of a number of papers which have appeared in professional journals.

Sister Mary Berenice has had long experience on the ASHP Executive Committee, having been elected to the position on two previous occasions. She has also served as Chairman of the Committee of Minimum Standards.

The officers named above, with the exception of the Secretary, will be installed during the ASHP Annual Meeting to be held in connection with the Convention of the American Pharmaceutical Association in Las Vegas during the week of March 25, 1962.

The ballots for the recent election were counted by a Board of Canvassers appointed by President Jack Heard. Included on the Board were Robert A. Statler, Veterans Administration, Department of Medicine and Surgery, Washington, D. C.; Ugo F. Caruso, Fairfax Hospital, Falls Church, Virginia; Franklin D. Cooper, George Washington University Hospital, Washington, D. C.; and Robert E. Lawson, University Hospital, University of Maryland, Baltimore, Maryland.

The present officers of the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS, who will continue to function until the Annual Meeting in March are: President Jack S. Heard, San Francisco, California; Vice-President Gerard J. Wolf, Mercy Hospital, Pittsburgh, Pennsylvania; Secretary Joseph A. Oddis, Washington, D. C.; and Treasurer Sister Mary Berenice, St. Louis, Missouri.

Archambault is President-Elect of A.Ph.A.

► GEORGE F. ARCHAMBAULT, immediate past chairman of the A.Ph.A. Council, pharmacy liaison officer to the Office of the Surgeon General of the U. S. Public Health Service, and chief of the pharmacy branch, Division of Hospitals, U. S. Public Health Service, Washington, D.C., is President-Elect of the American Pharmaceutical Association. Dr. Archambault is also a Past President of the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS.

Practicing pharmacists J. Curtis Nottingham of Williamsburg, Virginia, and Lee E. Eiler of Dayton, Ohio, have been elected to serve as first and second vice presidents, respectively, during 1962-63.

Councilors elected to a three-year term commencing at the conclusion of the 1962 annual meeting are Grover C. Bowles, Jr., of Memphis, Tennessee; Robert

A. Hardt of Chicago, Illinois; and Frederick D. Lascoff of New York, New York.

The officers elected will be installed at the conclusion of the A.Ph.A. annual meeting in Las Vegas, Nevada, the week of March 25, 1962. The present officers of the A.Ph.A. who will continue to serve through the annual meeting next year are J. Warren Lansdowne of Indianapolis, Indiana, president; Rudolph H. Blythe of Philadelphia, Pennsylvania, first vice-president; and Noel E. Foss of Baltimore, Maryland, second vice-president.

Officers of the American Pharmaceutical Association are elected in a mail ballot by all active members in good standing, and the votes are counted by a Board of Canvassers appointed by the President. The Board of Canvassers, consisting of Chairman James O. Hubbard, Jr., Richmond, Virginia, R. David Allen of Arlington, Virginia, and Kenneth E. Hanson of Washington, D.C., met at A.Ph.A. Headquarters on Wednesday, August 30, 1961, to certify the results of the record vote.

The Honorary President of the A.Ph.A. is elected by the House of Delegates annually, and the Secretary and Treasurer are elected triennially by the House of Delegates. Heber W. Youngken, Sr., of Boston, Massachusetts, currently serves as Honorary President, while William S. Apple of Washington, D. C., was elected Secretary and Hugo H. Schaefer of Yonkers, New York, was elected Treasurer for a three-year term at the 1959 annual meeting.

► Dr. Madison V. Brown, formerly director of the Department of Professional Services and secretary of the Council on Professional Practice of the American Hospital Association, has recently assumed increased responsibility for the development and coordination of the Association's total program. He is an associate director of the AHA and is head of the Collaborative Research in Hospital Planning.

Replacing Dr. Brown as director of the Department of Professional Services and secretary of the Council on Professional Practice is Dr. Richard J. Ackart formerly executive director of the Virginia Blue Cross-Blue Shield, Richmond.

► The Annual Wisconsin Pharmacy Institute will be held at the University of Wisconsin, Madison, on October 25-28. Pre-institute activities begin on Wednesday with an open house at the School of Pharmacy. Institute sessions are scheduled on Thursday and Friday with social activities during the evenings. On Saturday, registrants will attend the Wisconsin vs. Ohio State football game with a homecoming party on Saturday evening at the Madison Inn.

The program and registration forms are available from the University of Wisconsin Extension Services in Pharmacy, 301 Pharmacy Building, Madison.

► The American College of Apothecaries will hold its Annual Convention at the Jack Tar Hotel in San Francisco, September 20 - October 2, 1961. Pharmacists attending the Convention will meet on Saturday, September 30 at the University of California Medical Center where the program will draw on members of the staff as speakers. There will also be a tour of the facilities of the Center as well as examination of exhibits in the College of Pharmacy. On Sunday afternoon, members of the College will tour a number of outstanding prescription pharmacies in the San Francisco area.

► Douglas L. Vivian, chief pharmacist at the Hurley Hospital in Flint, Michigan, is the recipient of a Ciba Citation of Merit plaque for his interest and work which resulted in the establishment of Flint's Poison Control Center. The award, established by Ciba Pharmaceutical Products, Inc., Summit, New Jersey, honors outstanding professional and community services in the field of pharmacy. The presentation was made by Zygmunt A. Hoffman, Ciba district manager, Detroit and Herman Radtke, Ciba professional service representative, Flint.

Rosenbluth Receives Degree and Certificate of Residency

Sidney A. Rosenbluth recently received the Master of Science Degree from the University of Texas, Austin, Texas, and a Certificate of Residency in Hospital Pharmacy from the University of Arkansas Medical Center, Little Rock. Mr. Rosenbluth is a graduate of the University of Oklahoma and is registered in Oklahoma and Texas. He served hospital pharmacies in the Air Force for three years, including two years as chief pharmacist at Lackland Air Force Base Hospital, San Antonio. He now plans to spend some time in hospital pharmacies in Europe and will return to continue graduate study toward a Ph.D.

Sidney A. Rosenbluth is shown receiving the Certificate of Residency from Nelson Evans, administrator of the University of Arkansas Medical Center. Dr. William Heller, director of Pharmacy Service is shown at left

SELECTED PHARMACEUTICAL ABSTRACTS

and summaries of other articles interesting to hospital pharmacists

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edited by NORMAN HO

CHEMOTAXONOMY OF MEDICINAL PLANTS

Chemical Characteristics of Plant Families of Medicinal Importance. II Pteridophytes, Gymnosperms and Monocotyledons, Tyler, V.E., Lloydia, 24:57 (June) 1961. (Drug Plant Lab., College of Pharmacy, University of Washington, Seattle 5).

This article presents a summary of the chemical characteristics of all families of pteridophytes, gymnosperms, and monocotyledons, about which chemotaxonomically useful information could be gathered. The summary was undertaken to provide an outline or framework to serve as a guideline for further development of the science of chemotaxonomy. In the family of Pteridophytes, the following are present: (A) Equisetaceae—1 genus of about 25 species; (B) Lycopodiaceae—2 genera and about 100 species; (C) Polypodiaceae—about 170 genera and 7000 species. The family of Gymnosperms contains: (A) Cycadaceae—9 genera and about 100 species; (B) Ginkgoaceae—1 genus containing a single species; (C) Taxaceae—3 genera and about 13 species; (D) Podocarpaceae—7 genera and about 100 species; (E) Pinaceae—9 genera and about 210 species; (F) Cupressaceae—15-16 genera and about 140 species; and (G) Ephedraceae—1 genus and about 42 species. In the family of monocotyledons, the following are present; (A) Gramineae—about 500 genera and 4000 species; (B) Palmae—210 genera and more than 4000 species; (C) Araceae—about 105 genera and 1400-1500 species; (D) (Order) Liliflorae; (E) Liliaceae—about 240 genera and 4000 species; (F) Amaryllidaceae—86 genera and about 1310 species; (G) Dioscoreaceae—10 genera and 650 species; (H) Iridaceae—58 genera and about 15000 species; (I) Zingiberaceae—about 47 genera and 1400 species; and (J) Orchidaceae—about 450 genera and 10,000-15,000 species.

LAWRENCE J. RASERO, JR.

ASSAY OF RAUWOLFIA

Estimation of Weaker Bases in Rauwolfia Serpentina Benth and Allied Species, Basu, N. F., and Ghosh, S. K., Indian J. Pharm., 23:148 (June) 1961. (Dept. of Pharmaceuticals, Banaras Hindu University).

An assay process based on isolation and estimation of weaker bases present in *Rauwolfia serpentina* Benth and allied species by non-aqueous titration has been developed. When a chloroformic solution of the total alkaloids is shaken with 0.5 N sulfuric acid, the weaker bases are retained in chloroform, from which, after dilution with peroxide free ether, they can be transferred to a citric acid solution. This solution is rendered alkaline with ammonia and the weaker bases taken up again in chloroform. The chloroform is removed and the bases titrated with perchloric acid in non-aqueous medium, using an 0.1% solution of quinaldine red in absolute methanol as an indicator and noting the end point when the pink color just disappeared. Each ml. of 0.1 N perchloric acid was taken to be equivalent to 0.006087 Gm. of weaker bases calculated as reserpine.

LAWRENCE J. RASERO, JR.

ACTIVATION ANALYSIS, COPPER IN BIOLOGICAL MATERIAL

The Determination of Trace Quantities of Copper in Biological Material by Radioactivation Analysis, Pijck, J., Ruttink, J., and Claeys, A., J. de Pharmacie de Belgique 16:207 (May-June) 1961. (University of Ghent, Ghent, Belgium).

Trace amounts of copper in biological fluids, tissue and plant materials are determined by activation analysis. The method involves taking biological samples and copper standards, irradiating them simultaneously under identical conditions, and comparing the resulting activities. In the irradiation step, the biological specimen (250 mg. or less) and the copper standards were sealed in polyethylene containers and subjected to a central flux of 5×10^{11} to 8×10^{11} neutrons per square centimeter per second for 24 hours. The radiation detected from the resulting Cu^{64} consisted mainly of the 0.511 MeV gammas caused by beta-positron annihilation. The detector used was a Tl activated NaI scintillation well-type crystal. The method is proven by comparing results with those obtained by spectrophotometric determinations. A series of tests of blood serum, human hair and plant material demonstrate that the results can be compared with those of other methods and can be readily reproduced. A great advantage of this radiometric method is the small sample required, as small as 25 microliters compared with 10 milliliters for the spectrophotometric method. The authors speculate that it should be possible to determine copper down to the 0.1 to 0.05 microgram range by using their radioactivation method.

LEONARD C. SISK

EXTRACTION OF PHENOTHIAZINES

Selective Extraction and Colorimetric Determination of 10-Dialkylamino-alkyl Phenothiazines, Kotionis, A. Z., Aozneimittel-Fooschung (Drug Reasearch) 11:108 (Feb.) 1961. (Analytical Lab. of Athens Dye, Moschaton, Greece).

A simple and accurate method for the determination of microgram quantities of dialkylaminoalkyl phenothiazines is described. The method is based upon the formation of a chloroform-soluble complex with bromothymol blue in the molecular ratio of 1:1. The ability of the phenothiazine compounds to form complexes with some organic and inorganic anions was further established in the study of their partition solubility between aqueous buffers and chloroform. This study revealed that the phenothiazines form chloroform-soluble complexes with chloride and phthalate ions which are stable in acid solution. Based on this finding a simple selective extraction method is described.

LAWRENCE J. RASERO, JR.

KARAYA AND TRAGACANTH GUM

A Comparative Study of Gum Tragacanth and Gum Karaya, Ind. J. Pharm. 23:99 (Apr.) 1961. (Dept. of Chemical Technology; Univ. of Bombay, Bombay-19, India).

A comparative study of tragacanth and karaya gums has indicated that karaya can be used as a substitute for tragacanth in pharmaceutical preparations. With the same concentration, karaya gives less viscous mucilage than tragacanth, but that does not affect its suspending properties. Karaya mucilage tends to become less viscous on aging while tragacanth becomes more viscous. The pH of both mucilages did not change with concentration of the gums; initial pH of karaya mucilage (pH 6.4) was lower than that of tragacanth (pH 4.6), but both had the same pH 4.4 after nine days storage. The emulsifying properties of karaya are considerably improved when it is neutralized. It can withstand higher concentration of alcohol as compared to tragacanth.

NORMAN HO

CHEMICAL ASSAY OF DIGITALIS

The Chemical Assay of Digitalis, Bhatt, J. G., Brindle, H., Macdonald, A., J. Pharm Pharmacol. 13:283 (May) 1961. (Department of Pharmacology, University of Manchester, England).

A method suggested by Williams (1958) for the separation of "digitoxin" and "primary glycosides" from digitalis leaf extract, using a column of cellulose powder, has been re-investigated. Two digitalis leaf samples were assayed chemically for their content of total glycosides, "digitoxin" and "primary glycosides," using a solution of 3,5-dinitrobenzoic acid as the reagent. The total activity and the activity of the two fractions, namely "digitoxin" and "primary glycosides," were also determined biologically using rabbit isolated auricles and pigeons (U.S.P. XV method). From the results of the chemical assays it was concluded that in some assays some substance, less

biologically active than digitoxin must react with the reagent used, and in others the full biological activity was not indicated chemically. Biological estimations indicated that the two fractions were almost equal in potency, and that they accounted for the total activity. Comparisons of the activities of "pure" digitoxin and desacetyldigilanid A by biological methods confirmed that the primary glycoside was almost three times as active as digitoxin.

AUTHOR'S SUMMARY

COUNTERCURRENT SEPARATION OF ALKALOIDS

Countercurrent Separation of Solanaceous Alkaloids, Underhill, E. W., Youngken, H. W., Jr., and Tsao, D.P.N., Lloydia 24:65 (June) 1961. (College of Pharmacy, University of Rhode Island, Kingston, R. I.).

A countercurrent distribution apparatus has proven highly efficient in separating mixtures of hyoscyamine and scopolamine obtained from extracts of *D. stramonium*. Countercurrent separation of the alkaloid material was carried out using equal volumes of a phosphate buffer saturated with chloroform and a buffer-saturated chloroform as the two phases. The alkaloids were dissolved in 10 ml. of buffer-saturated chloroform and introduced as the lower phase in tube number 0 of the apparatus. At the end of 49 transfers the alkaloid occurring in tubes three through eleven was scopolamine while that occurring in tubes thirty through forty-two was hyoscyamine.

LAWRENCE J. RASERO, JR.

PHOTO-EFFECT ON PLANTS

Effects of Light Quality on Plant Maturity. I. Duration of Growth, Nutrient Supply, and Photoperiod, Kwack, B. H. and Dunn, S., Lloydia, 24:75 (June) 1961 (Department of Botany, University of New Hampshire, Durham).

Experiments with a dwarf pea, *Pisum sativum L.*, cultivar Little Marvel, were conducted to study effects of various light qualities of equal intensity on dry-weight yields of pods and numbers of seeds per plant, under light-laboratory conditions with three different environmental variations were: (I) the duration of total growth in days; (II) the concentration of nutrients; and (III) the daily photoperiod during the mature stage. For the first of these variations, three different lengths of growth periods during the mature stage showed significant increases under all the lights tested for 30 days as compared to 10 days, but none for 40 days as compared to 30 days. With the second set of variations there were no significant differences in yields. With the second set of variations, there were no significant differences in yields. With the third set of variations, increases in length of photoperiod caused marked increases in yields. Yields were greatest with red and blue light, intermediate with incandescent, pink, and warm white light, and poorest with yellow and green light.

LAWRENCE J. RASERO, JR.

DOSE-RESPONSE MATHEMATICS

The Relation between the Growth of Lactobacillus Leichmannii 313 and the Concentration of Essential Growth Substances, Noer, B., Dansk Tidsskr. Farm. 35:81-89 (May) 1961. (Microbiological Laboratory, A/S Ferrosan, Copenhagen).

The object was to find mathematical functions applicable as dose-response curves for essential growth substances for *Lactobacillus leichmannii*. These essential growth substances were determined and their consumption during the growth investigated.

For substances of which there is a large consumption during the growth, the dose-response curves were found to follow the Langmuir adsorption isotherm. An empirical investigation on the Langmuir adsorption isotherm as a formula for microbiological dose-response curves seems to show that it is applicable for essential substances which are completely consumed during the growth. Of the theoretically more well-founded formulas, some cannot be verified by practical experiments, whereas the highly simplified ones,—*i.e* the formula for growth intensity curves, and the approximation to the dose-response curve for phenylalanine and leucine—seem to indicate that bacterial growth may be considered a chemical process which follows the kinetic laws of reaction.

On the basis of the theory that bacterial growth is interpretable as a chemical process of high order, a velocity equation was set up.

The dose-response curves for histidine, phenylalanine and leucine, which are used to a slight degree during growth revealed a clearly linear orientation of the relation $\log \frac{N}{N_{opt}-N}$ and D as far as phenylalanine and leucine were concerned.

AUTHOR'S SUMMARY

FLUORESCENCE OF PORPHYRINS

The Fluorescence of Porphyrins, Duric, D., Arch. Pharm. Yugoslavia 11:5 (Jan.) 1961. (Institut Za Medicinu, Rada Nrs, Beograd).

The porphyrins are very important pigments with pyrolic structure. The planar structure with conjugate bonds (resonance) made possible a good adsorption of light and fluorescence.

The world literature about fluorescence and quenching of fluorescence of porphyrins is reviewed, especially the relations between structure, concentration, pH and other factors and these phenomenons.

Author included also summary of his work on the problems of fluorescence of porphyrins in liquid media and adsorbed on some substances. Author describes his experiments with adsorption of hemato-, copro-, and uroporphyrins on magnesium hydroxide and magnesium phosphate. In this case the fluorescence of porphyrins is increased more than twice. The hypothetical explanation is discussed.

Author studied also the quenching of fluorescence of porphyrins with 20 quenching agents, which results are mathematically elaborated after Stern-Volmer equation.

AUTHOR'S SUMMARY

CURRENT LITERATURE

. . . also calling your attention to the following articles appearing in recent hospital and pharmaceutical journals

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ADMINISTRATION

—General Organization and Administration

Bowles, Grover Jr.: Pharmacists' Education, Experience Qualify Them for Committee Work, *Modern Hosp. 97*:100 (Aug.) 1961.

—Cost of Medications

Myers, Robert S.: Why Hospital Drug Prices Baffle Patients, *Modern Hosp. 97*:67 (Aug.) 1961.

—Dispensing

Blumberg, Mark S.: Hospital Automation: the Needs and the Prospects, *Hospitals 35*:34 (Aug. 1) 1961.

Nicolaides, Martha Jane and Autian, John: Plastics—A Potential Problem in Hospitals, *Hospitals 35*:63 (July) 1961.

Anon.: Brewer Drug Control System Helps Solve Pharmacy Inventory, Demand Problems, *Hosp. Topics 39*:57 (July) 1961.

Wilburn, Paul: We Tightly Control Drug Samples Via Our Hospital Pharmacy, *Am. Profess. Pharmacist 27*:52 (July) 1961.

—Personnel (Recruitment)

Anon.: Student Visitation Project Motivates Careers in Hospital Pharmacy, *Hosp. Topics 39*:55 (Aug.) 1961.

AMERICAN SOCIETY OF HOSPITAL PHARMACISTS

Bowles, Grover Jr.: Don Francke Reviews Pharmacy Audit to Society of Hospital Pharmacists (Report of ASHP Annual Meeting), *Modern Hosp. 96*:100 (June) 1961.

Anon.: Professional Audit, Legislative Outlook Highlight Sessions at A.Ph.A. National Meeting (Report of ASHP Annual Meeting and A.Ph.A. Convention), *Hosp. Topics 39*:69 (June) 1961.

CATHOLIC HOSPITAL ASSOCIATION

Anon.: Pharmacy (Convention Report), *Hosp. Progress 42*:84 (Aug.) 1961.

SMALL HOSPITALS

Nelson, Kenneth R.: Drug Control Standards for Nursing Homes, *Hospitals 35*:75 (June 16) 1961.

Superstine, Edward: A Small Hospital Has an Outstanding Pharmacy, *Hosp. Management 92*:78 (Sept.) 1961.

STATISTICS AND SURVEYS

Francke, Don E. *et al.*: Study of 7,004 Hospitals Shows that only 38% Employ an Rx Man (From Report of Audit of Pharmaceutical Service in Hospitals), *Am. Profess. Pharmacist 27*:38 (May) 1961.

GENERAL

Brown, Ray E.: Why Hospital Pharmacies Will Fill 50% of All Rxs, *Am. Profess. Pharmacist 27*:36 (May) 1961.

POSITIONS

in hospital pharmacy

The Personnel Placement Service is operated without charge for the benefit of hospitals and pharmacist members of the American Pharmaceutical Association and the AMERICAN SOCIETY OF HOSPITAL PHARMACISTS. The ultimate purpose is the improvement of pharmaceutical services in hospitals, by more adequately fulfilling hospital pharmacy personnel needs and by locating positions which provide challenging opportunities for pharmacists who have indicated an interest in a hospital career.

By participating in the service, the hospital indicates a desire to achieve a pharmaceutical service which meets the Minimum Standard for Pharmacies in Hospitals. A description of the position should be submitted to the Division of Hospital Pharmacy on the forms provided. The hospital will receive applications directly from the applicant. The hospital agrees to reply to each application received and to notify the Division of Hospital Pharmacy when the position is filled.

The pharmacist, by participating, agrees to submit a Personnel Placement Service Information Form to the Division of Hospital Pharmacy. The applicant will then be notified of openings listed with the Service as they become available and can negotiate directly with the hospital if he is interested. It is agreed that the Division of Hospital Pharmacy will be notified as soon as a position is accepted.

A listing of positions open and wanted will be made regularly in the AMERICAN JOURNAL OF HOSPITAL PHARMACY without charge. Neither the name of the hospital offering the position nor the name of the applicant will be listed, except by code. All inquiries should be directed as shown below, including the code number.

Address all inquiries to
Division of Hospital Pharmacy
2215 Constitution Avenue, N. W.
Washington 7, D.C.

positions open

STAFF PHARMACIST—518 bed general hospital located in New Jersey. Duties include dispensing and compounding drugs. Furnish information concerning medications to physicians and nurses. Must be registered. Forty hour week, liberal personnel policy. PO-309

CHIEF PHARMACIST—126 bed general hospital located in New York. Duties include purchases and/or prepares all medications administered to patients in the hospital. Must be registered. Forty hour week, liberal personnel policy. PO-308

ASST. CHIEF PHARMACIST—225 bed general hospital. Duties include compounding and dispensing drugs and medications for hospital inpatients and outpatients. Must be eligible for licensure in Hawaii. Forty hour week, liberal personnel policies. PO-307

STAFF PHARMACIST—425 bed general hospital located in Illinois. Duties include dispensing drugs. Must be registered. Forty hour week, liberal personnel policies. PO-306

ASST. CHIEF PHARMACIST—327 bed general hospital located in Western North Carolina. Duties include assisting in all operations of the pharmacy and assume full responsibility in absence of chief pharmacist. Forty hour week, liberal personnel policy. PO-305

ASST. CHIEF PHARMACIST—450 bed general hospital. Duties include supervising Inpatient Dispensing Laboratory; ordering drugs, some sterile preparations and limited bulk compounding. Must have M.S. and registration in California. Forty hour week, liberal personnel policy. PO-304

STAFF PHARMACIST—1000 bed general hospital located in Iowa. Duties include inpatient and outpatient service. Must have B.S. but need not be registered. Can serve internship for board requirements prior to registration. Forty hour week, liberal personnel policies. PO-303

STAFF PHARMACISTS—300 bed general hospital located in California. Must be registered. Forty hour week, personnel policies. PO-302
ASST. CHIEF PHARMACIST—295 bed general hospital located in New York. Must be registered. Forty hour week, personnel policies. PO-301

ASST. CHIEF PHARMACIST—324 bed general hospital located in Ohio. Duties include supervising, compounding, filling inpatient and outpatient prescriptions, and advising physicians and nurses regarding new drugs. Forty hour week, liberal personnel policy. PO-300

STAFF PHARMACIST—180 bed general hospital located in California. Duties include filling prescriptions for inpatients and outpatients, floor supplies for nursing stations and assisting chief pharmacist. Forty hour week, liberal benefits. PO-299

ASST. CHIEF PHARMACIST—1200 bed general teaching hospital. Duties include drug procurement; receipt; storage; prepackaging; compounding; issue and annual inventory of pharmaceuticals; maintaining records; supervising pharmacy function and administrative duties. Male required and eligible for New York registration. Forty hour week, extensive personnel policy. PO-298

CHIEF PHARMACIST—116 bed general hospital located in Ohio. Duties include purchasing, filling, pricing, and dispensing medicines, maintaining records, etc. Must be registered and have five years' hospital pharmacy experience. Forty hour week, liberal policies. PO-295

STAFF PHARMACIST—400 bed general hospital located in Pennsylvania. Duties include compounding and dispensing medicines, manufacturing, and assisting chief pharmacist. Female preferred. Forty hour week. PO-294

CHIEF PHARMACIST—427 bed general hospital. Pharmacy staff consists of five pharmacists. Applicant must have M.S. degree and registration in Missouri. Forty hour week, vacation and sick leave. PO-292

STAFF OR ASST. CHIEF PHARMACIST—441 bed teaching hospital located in Missouri. Assist chief in compounding and dispensing drugs to inpatients, clinic patients and related duties. Forty-four hour week. Must be registered in Missouri. PO-289

CHIEF PHARMACIST—450 bed general hospital located in Indiana. Duties include purchasing and dispensing of drugs, working with nursing and medical staff, administration and staffing of department. Must be registered, and have a minimum of three years' hospital pharmacy experience. Forty hour week, liberal benefits. PO-283

CHIEF PHARMACIST—190 bed general short-term hospital located in Michigan. Duties include purchasing and dispensing drugs, assist in teaching student nurses. Hospital pharmacy experience. Forty-two hour week, vacation, sick leave and retirement plan. PO-280

STAFF PHARMACIST—280 bed general short-term hospital located in Texas. Duties include filling of inpatient and outpatient prescriptions, floor stock, and maintaining records. Must be registered. Forty hour week, liberal personnel policy. PO-279

STAFF PHARMACIST—300 bed general short-term hospital. Duties include inpatient and outpatient dispensing, bulk compounding and manufacturing, sterile preparations, and control. Male preferred. Must have B.S. and be eligible for registration in Michigan. Forty hour week, liberal benefits. PO-278

STAFF OR ASST. CHIEF PHARMACIST—300 bed hospital. Duties include compounding and dispensing medicines, assist in purchasing, maintaining records, furnishing information on medications. Must have B.S. and be eligible for registration in Indiana. Female preferred with experience. Forty hour week, vacation, sick leave, excellent personnel policy. PO-276

ASST. CHIEF PHARMACIST—212 bed general hospital. Duties include filling stock orders for nursing stations and other related duties. Must be registered in Illinois. Female preferred. Forty hour week, liberal personnel policy. PO-271

ASST. CHIEF PHARMACIST—130 bed general hospital located in Louisiana. Duties include compounding and dispensing drugs and related items, furnishing information to nurses and doctors, maintaining records, and assisting in purchasing and general management of the department. Forty hour week, vacation, hospitalization and sick leave. PO-270

STAFF PHARMACIST—700 bed University teaching hospital. Duties include inpatient and outpatient dispensing. B.S. required. Must be registered or eligible for registration in Wisconsin. Forty hour week, vacation and insurance program. PO-255

ASST. CHIEF PHARMACIST—317 bed general hospital located in Delaware. Duties include assisting chief pharmacist in carrying out procedures and policies. Male preferred with internship, preferably M.S. degree. Forty hour week, vacation, and liberal personnel policies. PO-254

STAFF AND ASST. CHIEF PHARMACIST—600 bed general hospital located in suburb of Chicago. Filling patient prescriptions. Forty hour week, excellent personnel policies. PO-252

STAFF PHARMACIST—237 bed general hospital. Duties include filling patient drug orders, outpatient prescriptions and assisting chief pharmacist. B.S. degree and registration in Iowa required. Forty hour week, vacation and sick leave. PO-250

STAFF PHARMACIST—525 bed general hospital located in Ohio. Duties include filling prescriptions for patients, floor stock and clinic patients. Must be registered in Ohio. Forty hour week, vacation and personnel policies. PO-249

STAFF PHARMACIST—700 bed general hospital. Duties include dispensing drugs from the central and clinic pharmacies. Registration in Georgia required. Male or Female. Liberal personnel policies. PO-245

STAFF PHARMACIST—275 bed private hospital in Chicago. Applicant will compound and dispense drugs and medicines. Must be licensed in Illinois. Forty hour week, vacation and other liberal benefits. PO-243

STAFF PHARMACIST—520 bed general private hospital. Duties include compounding and dispensing medicines and preparations according to prescriptions. Female preferred. Must be registered or eligible for registration in Washington State. Forty hour week, vacation and other liberal benefits. PO-242

STAFF PHARMACIST—350 bed general hospital. Applicant will assume some supervisory responsibility. B.S. required. Must be registered or eligible for licensure in Ohio. Forty hour week, vacation, sick leave, holidays and group hospitalization. PO-235

CHIEF PHARMACIST—120 bed general hospital located in Kansas. Pharmacist will organize pharmacy department and assist in teaching pharmacology to student nurses. Must be registered or eligible for licensure. Forty-four hour week, vacation and other liberal benefits. PO-230

STAFF PHARMACIST—550 bed teaching hospital located in Virginia. No experience necessary. Female preferred. Forty hour week, vacation and liberal benefits. PO-226

CHIEF PHARMACIST—Psychiatric hospital located in Ohio. Must be registered in Ohio. Forty hour week, vacation and retirement benefits. PO-221

CHIEF PHARMACIST—2300 bed mental hospital. Pharmacist will have complete charge of pharmacy, drug orders, stocking, dispensing, compounding necessary records and other pharmacy duties. Must be registered in Ohio. Forty hour week. Vacation, holidays, insurance, retirement plan and sick leave benefits. PO-189

CHIEF PHARMACIST—264 bed general hospital located in Texas. Plans and directs pharmacy policies, compounds and dispenses medicines, purchases supplies and materials, maintains records, and prepares periodical reports. Must be eligible for or have M.S. degree. Forty hour week, vacation, retirement, sick leave and insurance plan. PO-177

STAFF PHARMACIST—200 bed general hospital. Duties include compounding, dispensing and manufacturing. Applicant must have B.S. in Pharmacy and be registered in Connecticut. Recent graduate acceptable. Forty-four hour week, vacation, pension plan and hospitalization. PO-168

STAFF OR ASST. CHIEF PHARMACIST—150 bed general hospital located in New Mexico. Generous benefits. PO-134

positions wanted

ASST. CHIEF PHARMACIST—Male, Single, Pharm.D. Hospital Pharmacy experience; extensive experience in manufacturing pharmaceuticals. Prefers to locate in the Philadelphia, Pennsylvania area. Registered in Pennsylvania. PW-370

CHIEF PHARMACIST—Male, Married. B.S. Served Hospital Pharmacy internship. Also has teaching experience. Will locate anywhere. Registered in Indiana. PW-369

ASST. CHIEF PHARMACIST—Male, Married. M.S. obtained at University of Kansas in 1960. Hospital pharmacy experience also experience in research. Will locate anywhere. Registered in Kansas. PW-368

STAFF OR ASST. CHIEF PHARMACIST—Male, Married. B.S. at University of Colorado in 1957. Will locate anywhere. Registered in Illinois. PW-367

CHIEF PHARMACIST—Male, Married. B.S. Nine years' hospital pharmacy experience. Will locate anywhere. Registered in Missouri and Illinois. PW-366

STAFF OR ASST. CHIEF PHARMACIST—Female, Single. B.S. One years' hospital pharmacy experience. Prefers to locate in the East or Texas. Registered in Iowa. PW-365

STAFF PHARMACIST—Female, Single. B.S. Served five months' hospital pharmacy internship. Will locate anywhere, preferably in the U. S. Registered in Province of Alberta, Canada. PW-364

ASST. CHIEF OR CHIEF PHARMACIST—Male, Single. Ph.G. Six years' hospital pharmacy experience. Prefers to locate in Maryland. Registered in Maryland, District of Columbia, and Florida. PW-363

PART-TIME PHARMACIST—Male, Married. Ph.G. and P.D. degrees. Extensive hospital pharmacy experience. Prefers to locate in Brooklyn, New York. Registered in New York, New Jersey and Pennsylvania. PW-361

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. B.S. Thirteen years' hospital pharmacy experience. Will locate anywhere. Registered in the District of Columbia, Ohio, Oregon and Pennsylvania. PW-360

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1948. Thirteen years' hospital pharmacy experience. Prefers to locate in Midwest. Registered in Minnesota and Illinois. PW-359

STAFF OR ASST. CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1957. Two years' hospital pharmacy experience. Prefers to locate in Ohio or Indiana. Registered in Ohio. PW-358

CHIEF PHARMACIST—Male, Married. Obtained M.S. in 1952 at University of Michigan Graduate School. Prefers to locate in East or Midwest, but will consider other areas. Registered in Pennsylvania and Ohio. PW-357

STAFF PHARMACIST—Female, Single. Obtained B.S. in 1961 at Philadelphia College of Pharmacy and Science. Prefers to locate in the East. PW-356

ASST. DIRECTOR OR DIRECTOR OF PHARMACY SERVICE—Male, Married. Obtained M.S. in 1957. Military obligations completed. Four years' hospital pharmacy experience. Prefers to locate in the Midwest. Registered in Ohio. PW-355

CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1952 at Medical College of Virginia. Three years' hospital pharmacy experience. Prefers to locate in the Southeast. Registered in Virginia. PW-354

STAFF PHARMACIST—Female, Single. Obtained B.S. in 1950 at St. Louis College of Pharmacy and Allied Sciences. Thirteen years' hospital pharmacy experience. Prefers to locate in Northwest or West. Registered in Missouri, Iowa and Florida. PW-353

STAFF PHARMACIST—Male, Single. Obtained B.S. in 1951 at Detroit Institute of Technology. Hospital pharmacy experience. Prefers to locate in the Midwest. Registered in Michigan. PW-352

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. Obtained B.S. at University of Illinois. Prefers to locate in Illinois. Registered in Illinois. PW-351

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1953. Seven years' hospital pharmacy experience. Prefers to locate in the West or Southwest. Registered in New York. PW-350

STAFF PHARMACIST—Male, Single. Obtained B.S. in 1959 at State University of Iowa. Prefers to locate in the Midwest. Registered in Iowa. PW-349

CHIEF PHARMACIST—Male, Married. B.S. obtained in 1957. Four years' hospital pharmacy experience. Will locate anywhere. Registered in Pennsylvania and the District of Columbia. PW-348

STAFF PHARMACIST—Male, Single. Obtained B.S. in 1960 at University of Utah. Prefers to locate in the West. Registered in Utah. PW-346

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1943. Hospital pharmacy experience. Prefers to locate in the South. Registered in Florida, Georgia and North Carolina. PW-345

CHIEF PHARMACIST—Male, Married. B.S. Served hospital pharmacy internship. Extensive hospital pharmacy experience. Prefers to locate in California. Registered in California, Massachusetts and Connecticut. PW-344

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1953. Hospital pharmacy experience. Prefers to locate in California. Registered in California. PW-343

CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1954. Seven years' hospital pharmacy experience. Prefers to locate in the Northeast. Registered in Connecticut and Pennsylvania. PW-341

STAFF OR CHIEF PHARMACIST—Male, Married. Obtained B.S. and M.S. in 1950. Eleven years' hospital pharmacy experience. Prefers to locate outside continental U. S. Registered in Nebraska and Illinois. PW-340

ASST. CHIEF PHARMACIST—Female, Married. Canadian Citizen. Five years' hospital pharmacy experience. Prefers to work in an American hospital overseas. Registered in Canada. PW-338

CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1952. Hospital pharmacy experience. Prefers to locate in the West, Northwest, Kentucky or Washington, D. C. Registered in Kentucky. PW-337

STAFF PHARMACIST—Male, Married. B.S. Hospital pharmacy experience. Will locate anywhere. Registered in Ohio. PW-336

CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1953. Seven years' hospital pharmacy experience. Served hospital pharmacy internship. Prefers to locate in the Southeast or Southwest. Registered in North Carolina. PW-334

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1954. Three years' hospital pharmacy experience. Prefers to locate in the West or East. Registered in Pennsylvania. PW-333

ASST. CHIEF OR CHIEF PHARMACIST—Female, Married. Obtained B.S. in 1958. Hospital pharmacy internship. Two years' hospital pharmacy experience. Prefers to locate in Florida. Registered in Florida and Alabama. PW-332

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1960. Hospital pharmacy experience. Prefers to locate on the East Coast. Registered in Florida and Georgia. PW-331

STAFF OR ASST. CHIEF PHARMACIST—Male, Married. One years' hospital pharmacy experience. Prefers to locate in Florida. Registered in Michigan. PW-330

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. Ph.G. Hospital pharmacy experience. Prefers to locate in Maryland. Registered in Maryland. PW-329

CHIEF PHARMACIST—Male, Married. B.S. Hospital pharmacy experience. Will locate anywhere. Registered in New Jersey and Pennsylvania. PW-326

STAFF OR ASST. CHIEF PHARMACIST—Female, Single. Obtained B.S. in 1960. Hospital pharmacy experience. Will locate anywhere. Registered in Michigan. PW-324

ASST. CHIEF OR CHIEF PHARMACIST—Male, Single. Obtained M.S. in 1960. Four years' hospital pharmacy experience. Prefers to locate in California or Missouri. Registered in California and Missouri. PW-322

CHIEF PHARMACIST—Female, Single. Obtained B.S. in 1956. Five years' hospital pharmacy experience. Prefers to locate in the East. Registered in Florida and Georgia. PW-320

ASSOC. DIRECTOR OR DIRECTOR OF PHARMACY SERVICE—Male, Married. Obtained M.S. in 1960 at University of Michigan. Teaching and hospital pharmacy experience. Served hospital pharmacy internship. Will locate anywhere. Registered in Pennsylvania. PW-319

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1960. Prefers to locate in the Southeast. Registered in Tennessee. PW-317

CHIEF PHARMACIST—Male, Single. Obtained B.S. in 1955. Served hospital pharmacy internship. Hospital pharmacy experience. Registered in Texas. Will locate anywhere. PW-314

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1954 at University of Cincinnati College of Pharmacy. Three years' hospital pharmacy experience. Prefers to locate in Texas or Hawaii. Registered in Ohio. PW-313

ASST. CHIEF OR CHIEF PHARMACIST—Male, Single. Obtained M.S. in August, 1961 at State University of Iowa. Two years' hospital pharmacy experience. Prefers to locate in Midwest or West. Registered in Iowa. PW-311

STAFF PHARMACIST—Male, Married. Obtained B.S. in 1940 at Brooklyn College of Pharmacy. Will locate anywhere. Registered in New York, Pennsylvania, New Jersey and Florida. PW-307

ASST. CHIEF OR CHIEF PHARMACIST—Female, Single. B.S. Five years' hospital pharmacy experience. Prefers to locate in the Midwest or East. Registered in Illinois and Ohio. PW-297

STAFF OR ASST. CHIEF PHARMACIST—Male, Married. B.S. obtained in 1952 at Idaho State College. Prefers to locate in California. Registered in Idaho, Utah, Washington, Oregon and California. PW-296

CHIEF PHARMACIST—Male, Married. B.S. obtained at the Philadelphia College of Pharmacy and Science in 1951. Nine years' hospital pharmacy experience. Prefers to locate in the North, Midwest or West. Registered in Pennsylvania and Delaware. PW-294

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. Obtained M.S. at Philadelphia College of Pharmacy. Served hospital pharmacy internship. Three years' hospital pharmacy experience. Prefers to locate in Connecticut. Registered in Connecticut and Pennsylvania. PW-290

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. B.S. obtained at University of Illinois. Extensive hospital pharmacy experience. Prefers to locate in the East or Midwest. Registered in Illinois. PW-287

STAFF OR ASST. CHIEF PHARMACIST—Male, Married. Obtained B.S. in 1954 at Rutgers College of Pharmacy. Hospital pharmacy experience. Prefers to locate in Florida. Registered in Florida, New Jersey and New York. PW-286

STAFF OR ASST. CHIEF PHARMACIST—Male, Single. Obtained B.S. in 1959 at the University of Colorado. Completed hospital pharmacy internship at Denver General Hospital in June, 1960. Prefers to locate in the West or Midwest. Registered in Colorado. PW-284

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. Received at Ohio State University, B.S. in Biology in 1952 and B.S. in Pharmacy in 1955. Five years' hospital pharmacy experience. Willing to locate in the East, North or West. Registered in Ohio. PW-277

ASST. CHIEF OR CHIEF PHARMACIST—Female, Single. B.S. obtained in 1956 at University of Wyoming. Working towards M.S. at the University of Maryland. Served hospital pharmacy internship. Hospital pharmacy experience. Prefers to locate in the West. Registered in Wyoming. PW-276

ASST. CHIEF OR CHIEF PHARMACIST—Male, Single. M.S. obtained in 1958 at University of Texas. Hospital pharmacy experience. Prefers to locate in the Southwest. Registered in Kansas and Texas. PW-270

ASST. CHIEF OR CHIEF PHARMACIST—Female, Single. B.S. Fifteen years' administrative and practical experience in hospital pharmacy. Prefers Midwest, particularly Illinois or Wisconsin. Registered in Virginia, Illinois, Wisconsin and Michigan. PW-268

CHIEF PHARMACIST—Male, Married. B.S. Fourteen years' hospital pharmacy experience. Prefers to locate in the East or Midwest. Registered in Pennsylvania and West Virginia. PW-260

ASST. CHIEF OR CHIEF PHARMACIST—Male, Married. B.S. received at Detroit Institute of Technology in 1950. Four years' hospital pharmacy experience. Prefers to locate in Michigan. Registered in Michigan. PW-224

STAFF OR CHIEF PHARMACIST—Male, Single. B.S. received in 1952 at St. Louis College of Pharmacy. Two years' hospital pharmacy experience. Registered in Missouri. Prefers to locate on the West Coast, particularly California. PW-217

STAFF PHARMACIST—Female, Single. B.S. Seven years' hospital pharmacy experience. Southwest section of country preferred. Registered in Alabama and Georgia. PW-199

CHIEF PHARMACIST—Male, Married. B.S. Ten years' hospital pharmacy experience. Registered in Massachusetts, Illinois, Missouri, Kentucky, Tennessee and Virginia. Will locate anywhere. PW-150

CHIEF PHARMACIST—Male, Married. Graduate of St. Johns University College of Pharmacy. Extensive experience as chief pharmacist and purchasing agent. Prefers to locate in New York or New Jersey. Registered in New York and New Jersey. PW-144

CHIEF PHARMACIST—Female, Single. Twelve years' hospital pharmacy experience as a chief pharmacist. Prefers to locate in Pennsylvania and Ohio. Registered in Pennsylvania and Ohio. PW-111

Small Hospitals

► THE MAJORITY of small hospitals do not employ a licensed pharmacist, but somehow manage to maintain a drug service for their patients. It is not my purpose to discriminate against them, since they do perform a useful and needy service to their communities that would not be available if these hospitals did not exist.

Many of the small hospitals are financially unable to afford a pharmacist regardless of the advantages or improvements they would realize by employing him. Then, too, hospital pharmacists are not too plentiful, and it is not always possible for hospitals of small communities to compete with the salaries offered by those of the larger communities.

Often it is possible for the smaller hospitals to retain a local retail pharmacist on a part time basis. This offers a partial improvement in their drug service, but at best, lacks much control and organization because of the pharmacist's other interest.

I am sure most small hospitals are planning ahead to have a well equipped and operated pharmacy department, but they are basing their need on a future hospital of greater capacity and finances. At that time they will need the pharmacist to organize this department to control a more complicated flow of drugs. They will also expect him to create savings and efficiency in his operation.

In striving to improve patient care, the administration of the small hospital having no pharmacist should pursue any feasible course to obtain one —even if their operations are small. The patient and community deserves the best drug care possible, and this goal is only reached when there is a full time pharmacist to provide an adequate drug service by maintaining a department of organized drugs which are effective and sufficiently stocked. These advantages outweigh the cost of the pharmacists salary.

WILLIAM A. LIESCH, JR., president Texas Society of Hospital Pharmacists; Pharmacist, McAllen Municipal Hospital, McAllen, Texas.

—Reprinted from *Texas Hospitals* 17:29 (Aug.) 1961.

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